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H. M. S. MERSEY.

This ship, built at the Royal Dockyard, Chatham, is the first of a new class of "protected corvettes," strongly armed, to act as swift cruisers, and presents some structural characteristics which entitle her to be regarded as an innovation in admiralty ship building in England. It is evident that in future maritime operations of a hostile character the fast steaming cruiser will play an important part; and in order to render such craft seaworthy and shot proof, the "protective" principle of hexagonal steel plated hulls and superstructure decks has been adopted. In the Mersey, says the *Illustrated London News*, to which we are indebted for the cut and particulars, all the vital parts of the vessel—engines, boilers, magazines, and steering apparatus—are inclosed within a steel hexagonal hull, the plates varying from two to three inches in thickness. The upper and main decks could thus be demolished without affecting the stability or propelling powers of the vessel. Being designed as an armed cruiser, for service in which her usefulness, and her own safety upon occasion, will depend upon her speed and ability to maneuver rapidly, the Mersey is fitted rather for attack than defense. Although she might not be able to do much mischief to a fort or a first class ironclad, her armament, including two 8 inch and ten 6 inch breechloading guns, torpedoes, and ram, would make her a formidable opponent for any unarmored ship. The guns are disposed so as to give the power of firing with the greatest possible effect while maneuvering. The two large guns are pivoted, one on the forecastle and one on the poop. On either side, fore and aft of midships, are two projections or sponsons, and in each of these one of the 6 inch guns is placed, the others, three on a side between the sponsons, increasing the effectiveness of her broadside fire. Long ports in the forward sponsons permit the guns to be trained 4 degrees across the bow and to an angle of 60 degrees abaft, giving a lateral range of 154 degrees, while they may also be fired with a depression of 7 degrees or at an elevation of 20 degrees. The after sponsons admit of an equal range of fire. These guns carry their own shields for the protection of the gunners. The vessel also carries one 9 pounder and one 7 pounder boat and field gun, a 1 inch Nordenfelt, and two 0·45 inch Gardner guns. Whitehead torpedoes will be carried, and provision is made for discharging them either above or below water on each broadside.

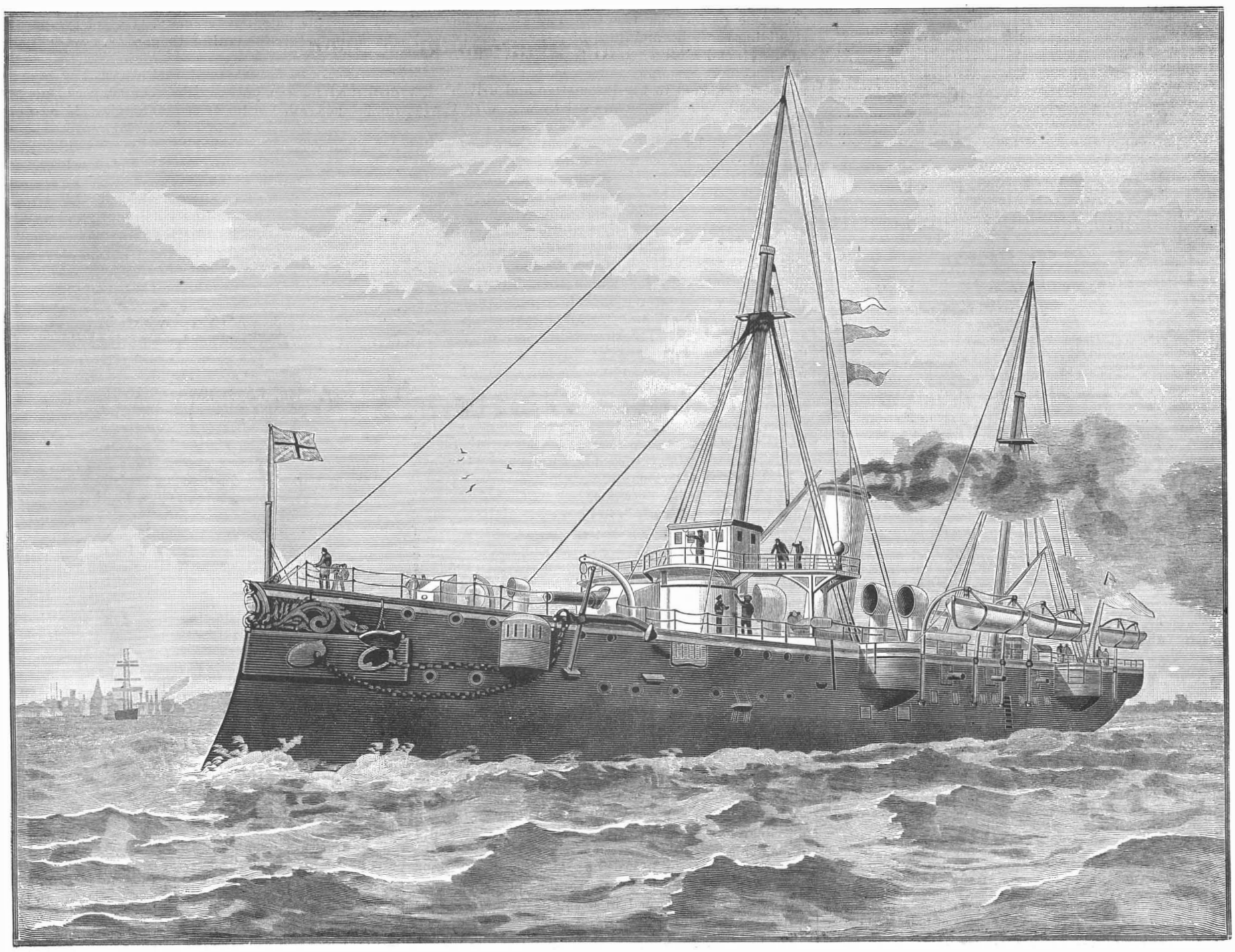
Except for the steel faced armor, 9 inches thick, protecting the conning tower and the steel protective deck plating, 2 inches thick where it is horizontal and 3 inches thick where it slopes downward across the coal compartments at the sides, the Mersey is unarmored. The authorized complement of coal is 500 tons. Her engines, of the horizontal compound pattern, are of 6,000 indicated horse power. She is provided with twin screw propellers, and her speed will be 18 to 19 knots an hour. The principal dimensions of the ship are; Length between perpendiculars, 300 feet; extreme breadth, 46 feet; mean draught of water, 17 feet 9 inches; load draught amidships, 19 feet; load displacement, 3,600 tons. Her crew will number 300 officers and men. The trials of her steaming were finished recently at Portsmouth, with very satisfactory results.

Earthquakes.

Some of the most severe earthquakes on record have taken place in February. At Lisbon, on the 26th of February, 1531, 1,500 houses were destroyed by an earthquake and 30,000 persons buried in the ruins. On the 2d of February, 1703, 5,000 lives were lost by an earthquake at Aquila, in Italy. On the 5th of February, 1783, a terrible earthquake took place in Italy and Sicily, destroying thousands of lives and overthrowing Messina and other towns. On the 4th of February, 1797, an earthquake destroyed the whole country between Santa Fe and Panama, including Cusco and Quito; and it is estimated that on this occasion, 40,000 people were buried in one second. On the 20th of February, 1835, an earthquake in Chili, besides effecting an immense amount of other damage, almost destroyed the city of Concepcion, knocking down the cathedral and most of the public buildings.

A Nearly Perfect Simple Pendulum.

Mr. J. T. Bottomley, of the University of Glasgow, suspends a small shot of about 1-16 of an inch in diameter, by a single silk fiber (half a cocoon fiber) two feet long, in a glass tube three-quarters of an inch in internal diameter and exhausts the latter to about one-tenth of a millionth of an atmosphere. Starting with a vibrational range of one-fourth inch on each side of its middle portion, the vibrations can be easily counted after the lapse of fourteen hours.—*Phil. Mag.*



H. M. S. MERSEY, NEW SWIFT CRUISER.

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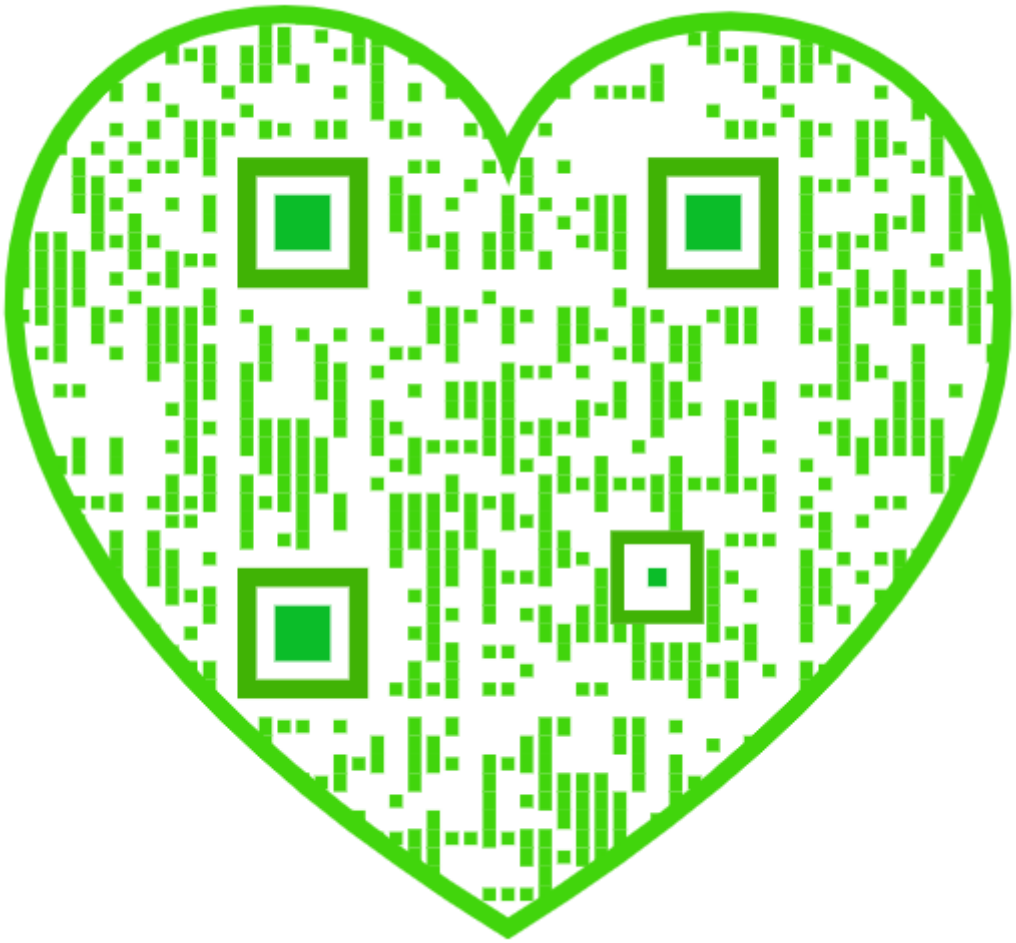

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CAR LIGHTING BY ELECTRICITY.

The regular Boston "special," on the Boston and Albany Railroad, was, last week, lighted by electricity and heated by steam—an arrangement which adds much to the comfort of passengers and removes altogether the danger from fire, always imminent in trains lighted and heated in the old way. The use of incandescence lighting on railway trains is not novel, nor is steam for heating. The Pennsylvania and other railroads long ago used this system of lighting on some of their special trains, and steam has been used for heating cars and other conveyances for years. But, up to the present time, no system of electrically lighting trains has proved satisfactory from a practical standpoint, and if that now adopted on the Boston "special" fulfills its promise, a really important advance will have been made in applied science.

In the system in use, electrical accumulators, commonly called "storage" batteries, are placed under the cars, and these having previously been charged from a dynamo-electric machine, while the train was lying in the depot, give out electrical energy as required. In this particular case, there are sixty cells to each car, and these, it is said, are good for the round trip between Boston and New York, thus necessitating the maintenance of only one electrical station.

In every car there are twenty incandescence lamps, each of sixteen candle power, this being equal in intensity to a five foot gas burner. As these lights glow in a vacuum without combustion, there is no danger of their setting anything afire in case of accident. Indeed, the entrance of oxygen through the breaking of a globe puts an instant end to the life of the lamp.

It is not at all likely that, even should the system now in use on the Boston "special" realize all that is promised for it, it would come to be generally adopted on the railway. It is too expensive. But, if it succeed in this instance, it will, no doubt, be used on many, if not all, similar trains, to wit, special trains on which an extra rate is charged for speedy and comfortable travel.

It should not, however, be forgotten by those who are interested in this subject that other and equally important experiments are now making, looking to the electrical lighting of trains by various and, it is said, cheaper means than that afforded by the movable accumulator. In one of these a small electrical generator is placed under each car, and this, being coupled up with the car axles, continually charges an accumulator, the same performing the two important offices of steadying the lights and furnishing the required energy to keep them aglow when the train stops. In another and still more economical system, a dynamo-electric machine is affixed to the locomotive and driven by a small auxiliary engine, connected by wire with the incandescence lamps in the cars. Then we have the system, now under active experimentation, of making small dynamos, affixed to the axles of each car, supply electrical energy directly to the lamps. This is, undoubtedly, the least costly and troublesome, and, consequently, the most promising system of all, provided, of course, that it can be made to work with certainty. At the first look, the fact that the lights go out whenever the train stops would seem to make the system impracticable. Careful examination, however, gives this defect a less serious aspect. Special trains—and the system is not adapted for any others—stop rarely, and only at principal stations, which are always well lighted, and the promoters of this system say that the reflection of the strong light from the station is quite sufficient for the illumination of the train during the few moments of stoppage. Where the large voltaic arc electric lights are used at the railway stations, as they are at many points on the New York Central, for instance, this assertion is certainly borne out by the fact.

Looking at the various systems of electrically lighting trains which are here enumerated, we should say that that which is most certain in its working is likely to be the most popular, regardless of relative expense. If this can only be said of the system which is now being used on the Boston "special," then the fact that the electrical batteries must be taken out and put back again once a day is of little importance. But if one of these other systems which require no such multiplicity of manipulation should prove to be quite as reliable, the question would resolve itself into one of dollars and cents, and the choice between them would then be clearly in favor of the latter.

HEATING OF RAILWAY CARS BY STEAM.

An interesting practical article upon "Improved Methods of Heating Railway Trains" will be found in this week's SUPPLEMENT, by Mr. E. Powell Karr, C.E. The writer has reasoned *a posteriori*, *i. e.*, from the record of facts, as shown by the experiments with the Martin system upon the Milwaukee and St. Paul and other roads, rather than from a theory of cause as to what the effect ought to be; and the conclusions reached are, therefore, valuable and available as to the best course to be pursued in designing steam heating apparatus for railway trains.

The ordinary formulas in use for determining the velocity of flow and quantity of discharge of steam are too empirical, and lead generally to results which are absurd in the light of current practice.

The fundamental principle announced in the paper, that the velocity of flow is due to the rapidity of condensation and to no other cause, wonderfully simplifies the entire problem. The late esteemed mechanician, Robert Briggs, seems to have been fully conscious of this principle, but made no use of it in his valuable discussion of the question.

The unmodified formulas of Wiesbach and others refer more particularly to the flow of air and saturated steam, but for dry steam, such as that taken from the dome, the resistances to be overcome, although considerable, are greatly modified and lessened. The paper calls attention indirectly to our lack of knowledge upon the subject of the loss of heat by the impact of cold air upon the surface of a moving object, and the solution of the question offers a wide field of original research to the physicist and the engineer. Its solution is of the widest practical value.

The important practical features of the paper are the tabulated results, the precautions which must be taken to insure success, and the neutral ground pointed out between excessive pressure, with reduction of weight of piping, on the one hand and the minimum of pressure, with excess of weight of piping, on the other.

The condensation called for by the calculations so closely approximates the recorded amount of condensation under circumstances so similar that the result is an invaluable confirmative aid to future investigations.

Lucky Buyers of Inventions.

The life dream of a Lowell lady has been that the number 272,751 was to be her lucky number. Some years ago she invested a small amount of money in letters patent bearing the favorite number 272,751. She claims the purchase was made to assist the inventor, who lost his health in the late war, rather than for her own speculation, notwithstanding her belief in the number. After years of patient waiting she has been assured by some of the best judges in the State that she had chosen a lucky number, as it appears to-day that the goods which this patent covers are of considerable value. A Pennsylvania manufacturer tells a story of the inventor of a multiple of rolls or trucks used under the bottom of railroad cars between the truck frame and the body of the car. The inventor became pressed for funds and desired a loan of $100, assigning his patent as security. Out of sympathy, the manufacturer gave him the money, never expecting, as he says, to ever get a dime of it back, and threw the patent papers aside in his safe, where they lay undisturbed for ten years. One day a lawyer of his acquaintance called at his office and inquired if he ever bought a patent on friction rolls for a railroad car. After reflecting a moment, he told him that about ten years before he had loaned an inventor some money on a car patent, but he didn't ever expect to hear from it again. The lawyer told him that this patent was being used on almost every car now being built, and a large revenue could be collected. Terms were soon negotiated for collecting evidence of infringement; so that the loaning of $100 to help out the distressed inventor brought him more money than all his other business.—*Boston Journal.*

The money paid for patents which have remained dormant in the hands of the inventor for a long time after their issue is in the aggregate very large. Incidents similar to those related above come to our knowledge very often, where parties have received quite handsome sums for their patents after several years' waiting, when all hope of realizing anything from them had departed.

Upon referring to our file of Patent Office reports we find the patent referred to as the lucky number 272,751 was for a window blind support, a small invention, but seemingly a good contrivance, the merit of which had undoubtedly more to do with the woman's success than her dream.—ED.

Hindoo's Mode of Reaping and Cleaning Grain.

The *Milling World* tells its readers how the Hindoo reaps with an iron blade, six inches long, an inch wide, and curved like a sickle, costing him four cents. He squats on his heels, cuts a handful, lays it down, and without rising off his heels waddles forward and cuts another. In twelve days he cuts an acre, and receives five cents a day, boarding himself. When he wants to thrash his grain, he drives a stake in the ground, spreads his grain around it, ties a rope to his bull's horns and then to the stake, and drives them around and around till the straw is tramped very fine into what they call "bhoosa." This is fed to the cattle after the wheat is separated. Englishmen have introduced thrashing machines, but the Hindoos will have none of them. They think their cattle would not eat the straw because it breaks it instead of tramping it flat. They clean their wheat by holding it up in the wind in a scoop made of reeds, or, if the wind is not blowing, two Hindoos make wind by waving a blanket, while a third dribbles the grain from the scoop.

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A Trial of the Pneumatic Dynamite Gun.

On Saturday, March 26, an exhibition and trial firing of the pneumatic dynamite gun, with which Lieut. Zalinski's name is identified, took place at Fort Lafayette, at the entrance of the Narrows in New York Harbor. A numerous company was present, including representatives of the United States army, of its corps of engineers, and artillery, of the Spanish navy, and others. The trial consisted of the discharge of four shells, the range being in the direction of Coney Island Point, giving a clear water space of nearly three miles. The gun used was the large eight inch piece. The shells weighed in the neighborhood of 145 pounds, each containing a charge of upward of 50 pounds of explosive.

The main features of the gun have already been given in this paper. A tabular statement of the full results of these trials is given below. The air is admitted to the gun by a graduated valve, the action of whose cut-off is specified in the table, an arbitrary scale being used for that purpose. The object of varying the cut-off in these experiments was to illustrate how the range can be controlled thereby. The shells used were old ones, that had been in store for many months. The explosive gelatine which formed a principal portion of the charge was composed of 92 per cent of nitro-glycerine and 8 per cent of gun-cotton. Within it a core of dynamite was contained to act as the detonator. The results of the four shots tended to prove the practical success of the gun. A high range, in one case of upward of over two miles, was attained, and the control over the explosion by the delay primer and auxiliaries for deferring the time of explosion was very well exemplified.

While the dynamite gun originally was brought to the attention of the government by another inventor, a Mr. Mefford, and while several have contributed to perfecting its details, the distinctive feature of the shell, its system of priming, was invented and developed by Lieut. Zalinski. The explosion may be brought about by two methods. In using it against ironclads, both methods are combined. Two galvanic batteries are contained in the shell. One is a wet battery, which is kept charged. The other is a dry battery, which is brought to action only by being moistened. These two are arranged in series on one circuit. Part of the circuit is composed of a fine platinum wire, which is surrounded by gunpowder. If the dry battery is moistened, as by immersion in the water, the circuit is completed and the gunpowder explodes. It will be seen that the moistening of the dry battery not only acts to close the circuit, but by throwing this battery into action re-enforces the electromotive force of the other one. Perforations in the head of the shell admit water to the dry battery. These waterways are slightly obstructed by a shield, in order to prevent the inrush of fluid from disturbing the connections. By making them more or less devious, the action of the battery and consequent explosion of the powder can be delayed. Another element of delay can be introduced by modifying the construction of the dry battery. They can be made so that a single drop of water will establish a current, or so that a considerable immersion will be requisite for the same end. This much describes the system of water or immersion discharging. Besides this, a projecting mechanical circuit closer is used which closes the circuit irrespective of the dry battery, and thereby also effects detonation.

The battery, as has been seen, acts by exploding gunpowder. This is contained in a capsule, and the wire which is heated by the current is at one extremity of the capsule. At the other extremity is a charge of fulminate of mercury. This gives another method of delaying the explosion, by varying the length of the column of gunpowder intervening between the wire and the fulminate. The fulminate by its explosion causes the combined charge of gelatine and dynamite to explode.

The next distinctive feature about the shell to be mentioned is the point where the explosion begins. This is in the rear of the charge, the action being the reverse of the needle gun. The object of this is to create a species of gas tamping. The rear portions of the charge exploding first drive the rest of the charge ahead and hold it up to its work.

To determine the efficiency of this method of explosion, shells fired from a four inch dynamite gun have been tried against iron plates. In one case the charge was ignited at its forward end, in the other at its rear end, while in a third a shell charged with sand only was used. The shell charged with sand did considerable injury to the plates. The shell exploded from its forward end did less injury than was effected by the sand-charged shell; while the shell exploded from its rear end pierced a number of plates of iron, aggregating about four inches in thickness.

Several classes of duty can be performed by this gun. Its most obvious is the attack on a vessel. In this case a quick action primer is used, one which will explode the shell the instant it touches the vessel, or when the circuit is closed. The dry battery will afford sufficient delay, if the shell enters the water in the neighborhood of the vessel, to allow it to reach a good depth before exploding. Its other range of work may be termed sub-aqueous, where it is to be used for countermining torpedoes or for attacking vessels well beneath the water line. For this method of attack, delay primers are used, allowing it to penetrate to any given depth of water or to the bottom before exploding.

As an additional measure of precaution, spring circuit breakers are used, which, when the shell is within the gun, are held inward by contact with the walls of the bore, and are only released after the shell leaves the same. Hence, when the shell is within the gun, even if water were poured down the mouth, it would not explode, as the electric circuit would be mechanically broken.

As at present constructed, a composite shell is used, the head containing the explosive being of metal, attached to a wooden tail or guide piece. It is proposed in the future to make it entirely of metal, having a metallic tail piece with wings to cause a slight rotation or rifling motion to be imparted to the projectile.

The gun is loaded through its breech. Immediately back of it is placed a wooden sabot and a felt wad to prevent windage. The breech block is then closed, and all is ready for firing.

A cruiser is now under contract for the United States navy to be armed with these guns. On her it is designed to place three pieces, two of 10½ inches and one of 12½ inches caliber, the latter to discharge a shell carrying 200 pounds of explosive. The air is to be compressed to 2,000 pounds to the square inch, and an air reservoir is to be supplied so large that, when once charged, the ship will be able to go through a long action without any pumping. In the gun exhibited at Fort Lafayette, the gun reservoir was 137 cubic feet capacity, while a second or storage reservoir of but 100 cubic feet capacity was contained in the casemate of the fort.

An interesting feature of the practice is the perfect immobility of the gun. Attached to it was a sighting instrument, with delicate spirit level, After the discharge, the bubble in the level was quite undisturbed, and maintained its central position. The second shell fired, which attained an extreme range of 2,492 yards, ricocheted at the end of its course, clearing 436 yards in so doing. This contained a delay action primer, and exploded at the end of the ricochets. The third one parted from its tail piece, and hence had a greatly restricted range. It exploded with extreme violence on striking the water. On account of this, the fourth was tried, and attained a range of nearly 4,000 yards, but did not explode. It probably struck the bottom before the delay primer worked, owing to the shallowness of the water, and there broke to pieces. With regard to accuracy, it is evident that it could attain a very high degree of precision. We give in the second table results attained in firing, not at a specified mark, but under circumstances which enabled the place of fall to be accurately noted. These show how closely it can adhere to a given point of impact. Its deviations to the right or left and the amount by which it overshot a base mark are given.

I.—RESULTS OF EXPERIMENTS OF MARCH 26, 1887.

No. of fire.	Weight of shell.	Weight of charge (explosive gelatine and dynamite).	Initial pressure.	Final pressure.	Loss of pressure.	Setting of cut-off.	Elevation.	Time of flight—in seconds.	Range—yards.	Remarks.
			lb.							
1	146	50¾	1002	955	47	1·5	14°	9·6	1816	Quick action primer. Exploded.
2	144	50½	1001	933	68	1·0	14°	11 8	2492	Delay action primer. Exploded at end of ricochets.
3	143	50½	1005	905	100	0·8	33° 30′	20·8	2456	Tail broke. Exploded on striking.
4	139¼	50½	1005	905	100	0·8	33° 30′	25·4	3868	Did not explode.

II.—TRIALS BEFORE A NAVAL BOARD, JUNE 25, 1886.

	Deviation to right.	To left.	Overshot in yds.
1	16 feet.	—	417
2	—	8 feet.	438
3	—	9 "	417
4	—	22 "	417
5	—	16 "	417

Wind from right, 15 to 18 miles. After first shot, gun was moved to left. No other change was made. Range of buoy, 4,421 ft. Total range, 4,838 ft. These five rounds were fired in 9 m. 40 sec. No haste was made, and work of loading was done by untrained men.

THE Geo. F. Blake Manufacturing Co., of Boston, stands among the most prominent of New England concerns, and the pumps for every kind of use made at their works are found all over the world. Owing to increasing business, the company have just removed to more spacious quarters, at No. 113 Federal St. The new store is 60×110 feet, and the company will have some 13,000 square feet of space, including a well lighted basement, which will allow them to carry a larger assortment of finished pumps than ever before. The elevator will be run by electricity.

Work to be Pursued at the Naval Observatory, Washington, during the Year 1887.

CAPTAIN R. L. PHYTHIAN, U.S.N., SUPERINTENDENT.

With the Great Equatorial.—Observations of double stars will be continued. Observations of previous years will be discussed, if time and force will permit.

Continuation of measurements of the fainter stars in the Pleiades. Completion of these observations if possible.

Observations of the conjunction of the five inner satellites of Saturn with the minor axis of the ring, and the angles of position and the distances of the faint satellite Hyperion.

Reduction and discussion of the observations of former years, as time and force will permit.

With the Small Equatorial.—Observations of comets, whenever possible.

Observations of stars that need to be identified for the preparation of the third edition of Yarnall's catalogue, now in progress.

Observations of stars and asteroids for identification for the transit circle, and of such asteroids as cannot be observed with that instrument.

Observations of occultations of stars by the moon, whenever practicable.

With the Transit Circle.—Completion of the observations of miscellaneous stars for the proposed Transit Circle catalogue. Concurrently with these, observations of the sun, moon, and planets.

After the completion of the above observations (which, it is hoped, will be accomplished by the 1st of March), the instrument will be dismounted for repairs, and will thereafter be used in observations of:

The sun daily.

The moon throughout the whole lunation.

The planets, major and minor.

Stars of the American Ephemeris required for the determination of instrumental and clock corrections.

Miscellaneous stars, as may be deemed advisable.

The observations of preceding years will be reduced as rapidly as possible.

With the Transit Instrument.—Observations for the correction of the standard mean time clock daily.

The Repsold Circle (at Annapolis).—Observations of the 303 southern stars.

The 59 refraction stars of the Leiden observatory.

Auxiliary stars of the Berlin Jahrbuch.

Time Service and Chronometers.—Daily comparison of all chronometers on hand.

Daily noon signals over the wires of the Western Union and Baltimore and Ohio Telegraph Companies (Sundays excepted).

Correction, daily, of the clocks upon the Observatory Department time lines in the city of Washington.

Dropping, daily (Sundays excepted), of time balls at noon of the 75th meridian at the following points:

Wood's Holl, Mass., under the auspices of the Fish Commission.

Newport, R. I., under the auspices of the Torpedo Station.

New York city, under the auspices of the Western Union Telegraph Company.

Philadelphia, Baltimore, New Orleans, } Under the auspices of the Hydrographic Office.

Washington, Hampton Roads, Savannah, } Under the auspices of the Observatory.

Time balls will also be dropped from the Branch Observatory at the Navy Yard, Mare Island, on Telegraph Hill, San Francisco, through the Branch Hydrographic Office, and at the Navy Yard, at noon of the 120th meridian, daily (Sundays excepted).

The time service will be extended to such other points as may be deemed best, as funds will permit.

Test in the temperature room of such chronometers as have been repaired during the past year, including the plotting of their rate curves, with the necessary computations therefor.

The examination of nautical instruments will continue.

Photographs of the sun will be taken daily, when practicable, with the photo-heliograph of Transit of Venus Commission pattern.

Meteorological observations will be made as usual.

Danger in the Bottle.

Mr. G. W. Fitton writes to the *Chemist and Druggist* that he has narrowly escaped what might have been a serious affair. "Not having the blind down in front of the window as usual," he writes, "and the sun being very strong, the rays, after passing through a large carboy filled with the usual solution of bichromate of potash, were thrown on to the woodwork of the window inclosure, soon burning a piece nearly ¼ inch thick and 4 inches long; more would have followed had I not discovered it in time. Should like to know," he adds, "if you have heard of a case like this occurring before?"

There have been a number of similar incidents recorded, and it stands druggists in hand to be careful about displaying globular shaped jars in their windows where the sun's rays can be refracted by them.

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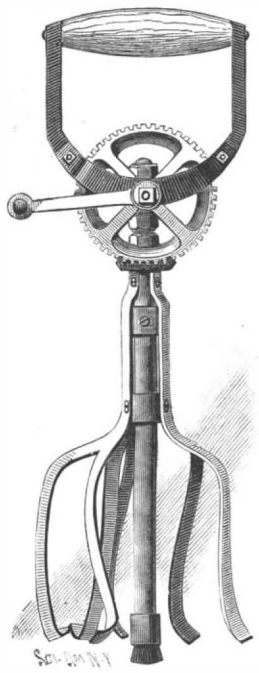
IMPROVED CAKE MIXER.

Passing through the lower portion of the handle is a rod, held in position by nuts and provided at its lower end with a socket to hold a cork. Held so as to turn in a metal plate attached to one side of the handle is a short horizontal shaft furnished with a toothed wheel at one end and a crank arm at the other. This wheel meshes with a horizontal bevel gear secured upon a metal ring held to turn upon the rod by a collar clamped to the rod just beneath the ring. Fastened to the ring, at equal distances apart, are three arms, which are also secured to another lower ring encircling the rod above its center. From the latter point of attachment the arms extend at various angles downward, around the rod, and at different distances from it, as clearly shown in the engraving. It is evident that, when the crank is turned, the batter or liquid will be most thoroughly mixed, owing to the different inclination and angles of the several mixers and beaters, whereby the batter will be whipped, thrown, and beaten in every direction throughout the entire mass. The beaters all have their edges inclined downward, the more readily to lift the batter from the bottom of the receptacle. The cork at the bottom of the rod is designed to rest upon the bottom of a glass or other easily destructible vessel employed to hold the batter.



This invention has been patented by Mr. M. D. Platner, of Virginia City, Montana.

SWIVEL BOGIE LOCOMOTIVE.

We illustrate a swivel bogie locomotive constructed by the Vulcan Foundry Company, Limited, Newton-le-Willows, for use on the fortification works at Chatham. This, says *Egineering*, is the first of a pair built to the designs of Major English, R.E., to replace similar engines sent to the Soudan. The interest of the design lies in the swing bogie frame behind the firebox. The bearings of the axle are mounted on a frame which receives the weight of the rear part of the engine on a vertical pivot. This pivot is mounted on the center of a cranked bar, the ends of which are carried in bearings in the bogie frame below the center of the axle. The frame is further steadied and tied to the framing of the engine by means of radius bars connected at one end to the axle boxes and at the other end to a center on the firebox. Thus the swivel axle has the greatest facility of motion in relation to the engine.

The engine will take a gross load of 45 tons up an incline of 1 in 35 at the rate of 10 miles an hour, the working pressure being 150 lb. The following are the principal particulars:

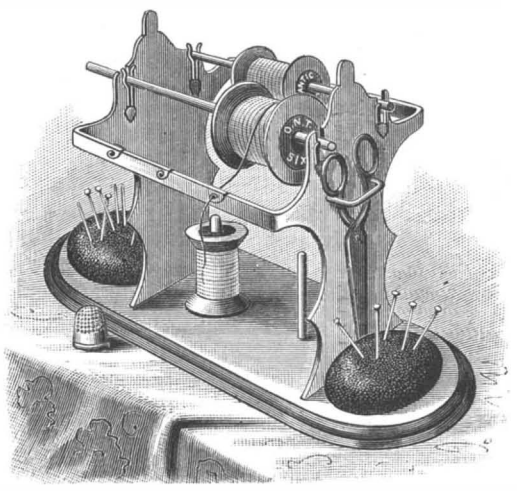
Diameter of cylinders, 7½ in.; stroke of cylinders, 12 in.; diameter of coupled wheels, 1 ft. 8¼ in.; diameter of bogie wheels, 1 ft. 8¼ in.; rigid wheel base, 3 ft.; total wheel base, 7 ft. 6 in.; capacity of tank, 200 gals.; capacity of coal space, 6 cwt.; tubes (71), 1¾ in. in diameter, 204 sq. ft.; firebox, 18·75 sq. ft.; area of grate, 4 sq. ft.; weight (loaded), 10 tons; gauge of rails, 18 in.

New Hydro-Oxygen Lamp.

Before the Physical Society, Berlin, Dr. Konig spoke of the disadvantages of the hydro-oxygen lamps, and demonstrated a new lamp constructed by Herr Linnemann, in which the unsteadiness in the light, arising from the fact that in the common lamp the flame burned now in the burning tube and now outside of it, was avoided. In the new lamp the coal gas or the hydrogen issued from a ring-shaped opening in the burner, while the oxygen in the center was admitted through a capillary tube, and did not come into contact with the burning gas till outside of the burner. In the middle of the blue flame was seen a bright point which gave the heat maximum. Instead of the lime cylinder, Herr Linnemann used in his lamp zircon plates, which, at the place of the bright point, gave a highly intense constant light. The speaker made use of this light in order, with the aid of the optical bench of Prof. Paalzow, to demonstrate by projection a long series of phenomena in connection with the doctrine of the polarization of light. For all teaching purposes and demonstrations this method of representing the most important optical phenomena could not be surpassed by any other.

SPOOL HOLDER.

The convenient device for holding spools of thread herewith illustrated is the invention of Mr. Wm. P. Clarke, of Winnipeg, Manitoba, Canada. The spools of thread are held upon rods received in notches in the tops of standards secured to a base. Near one end the rods are apertured and pivoted on wires bent downward and fastened to the upright. The opposite ends of the rods are received between spring clamps, as shown. To arms projecting from the sides of the standards are secured flat bars, in which are formed spiral slots, each terminating at its center in a round hole,

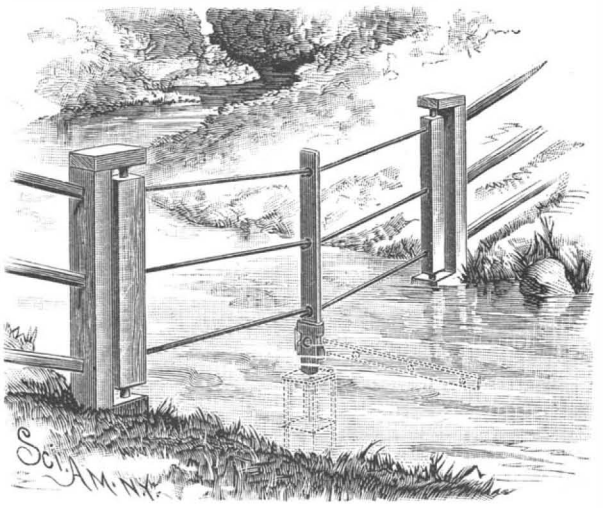


CLARKE'S SPOOL HOLDER.

through which passes the thread from the spools carried by the rods. To the outer sides of the uprights are attached oblong staples for receiving scissors. Spools are also placed on two vertical rods projecting from the base. On the ends of the base are placed pin cushions. The spools are placed on the horizontal rods by lifting them out of the spring clamps, slipping the spools upon them, and then replacing their free ends. The thread is then carried through the spiral slot to the hole in the center. By the use of this simple device the spools are never mislaid, and there is no waste of the thread.

IMPROVED FLOOD FENCE.

In building such a gate as the one here illustrated, two posts are mounted upon the banks of the stream, and each is formed with an upper and lower bracket. In these brackets supporting bars are pivotally mounted in such a way that their upper ends incline inward from a vertical line. These bars carry rods, whose overlapping free ends are supported by a post provided with holes, through which the rods pass. The post is pivoted to a foot, which may be secured in the ground in any desired manner. The upper end of the foot is concave, and the lower end of the post is also concave, and both are formed with similar ears. The



BURACKER'S IMPROVED FLOOD FENCE.

foot and post are united by a rivet or bolt, the two concave faces being placed together, from which arrangement it follows that the post will be normally held in a vertical position; but any undue pressure against it will turn it upon its pivot, so that it will lie horizontally, as indicated by the dotted lines in the drawing. It is evident that this gate will prevent the passage of cattle, but should the central part be struck by any heavy debris carried by the stream, it will be thrown down to a horizontal position. Owing to the peculiar manner in which the two sections of the gate are mounted, the rods would then immediately swing back to a position across the stream—that is, in a line parallel with the general line of the fence in connection with which the gate is used.

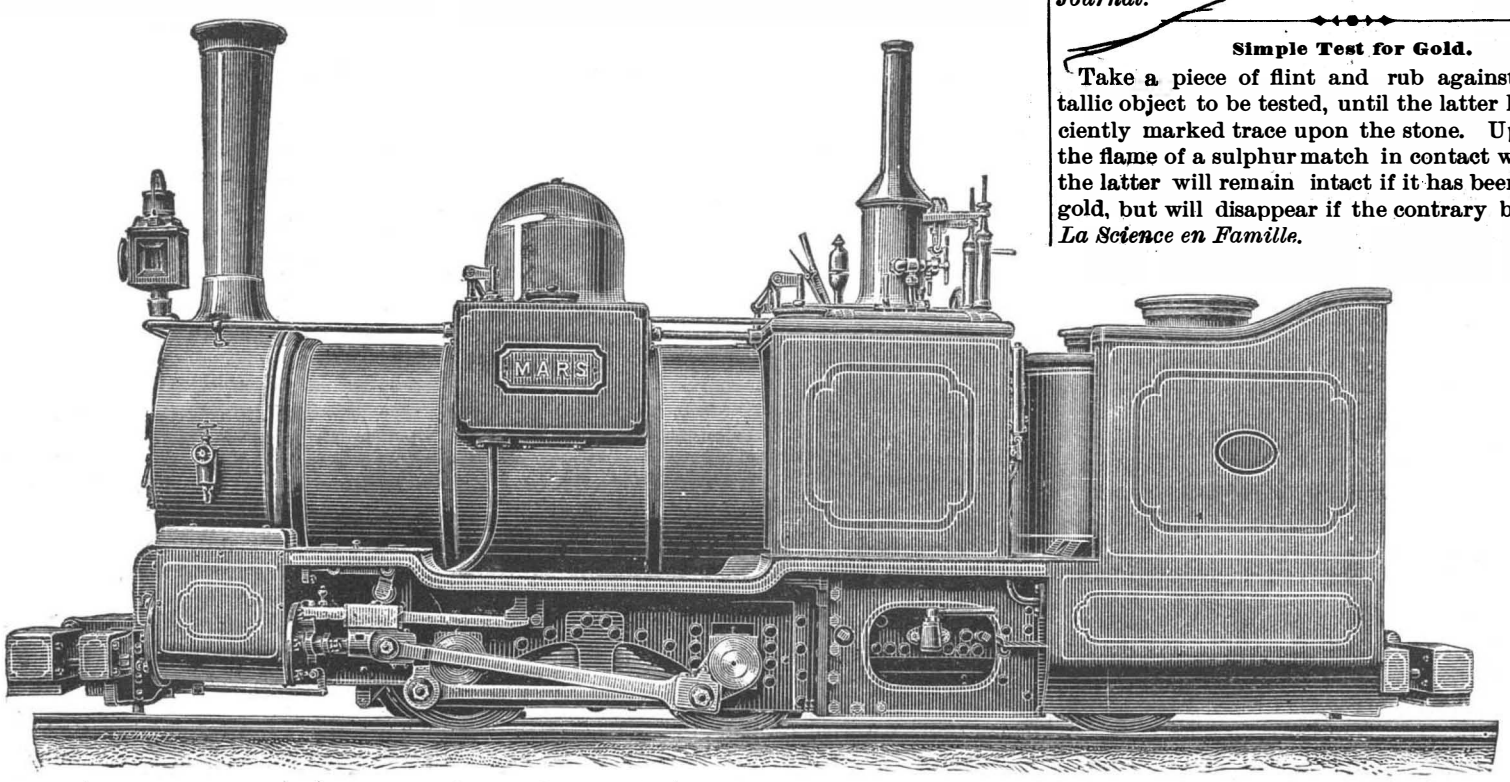
This invention has been patented by Mr. Ambrose Buracker, of Beardstown, Ill.

Hay Fever.

The time for hay fever to be prevalent is now rapidly approaching, and those who suffer from it will doubtless only be too glad to learn of any successful method of treatment. Dr. W. T. Phillips, of Andover, recommends belladonna, which he has found successful (*Br. Med. Journ.*, July 14, 1883). In the same journal (June 7, p. 1090) he gives the dose as 1¼ minims of the succus every hour till relieved (30 min. to 3 oz. of water). For coryza, Dr. G. E. Dobson recommends (*Lancet*, May 31, p. 978) the inhalation of the vapor of camphor and steam, the vapor being made to come in contact with the outer surface of the face, surrounding the nose by means of a paper cone placed with the narrow end downward in a vessel containing hot water and a drachm of coarsely powdered or shredded camphor. If this is continued ten or twenty minutes at a time, and repeated three or four times in as many hours, a cure is usually effected.—*Pharmaceutical Journal.*

Simple Test for Gold.

Take a piece of flint and rub against it the metallic object to be tested, until the latter leaves a sufficiently marked trace upon the stone. Upon bringing the flame of a sulphur match in contact with the spot, the latter will remain intact if it has been made with gold, but will disappear if the contrary be the case.—*La Science en Famille.*



LOCOMOTIVE FOR 18 INCH GAUGE RAILWAY AT CHATHAM.

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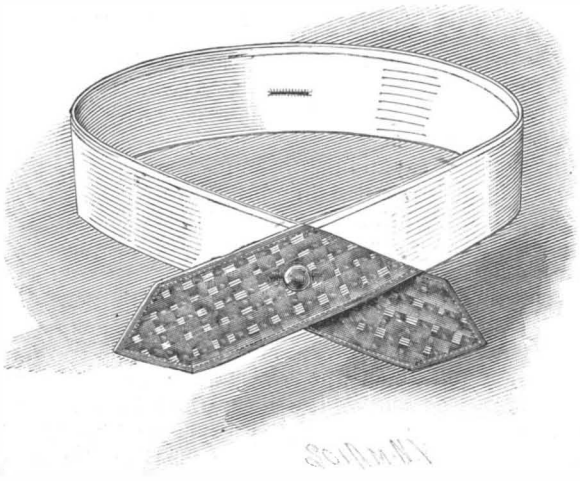
COMBINED COLLAR AND NECKTIE.

In the invention here illustrated the collar and necktie are so combined as to render unnecessary the use of a separate necktie. The collar may be made of linen, celluloid, zylonite, or other suitable material, and is provided with buttonholes for attachment to the neckband of a shirt. At the front of the collar is a necktie,



DOVE'S COMBINED COLLAR AND NECKTIE.

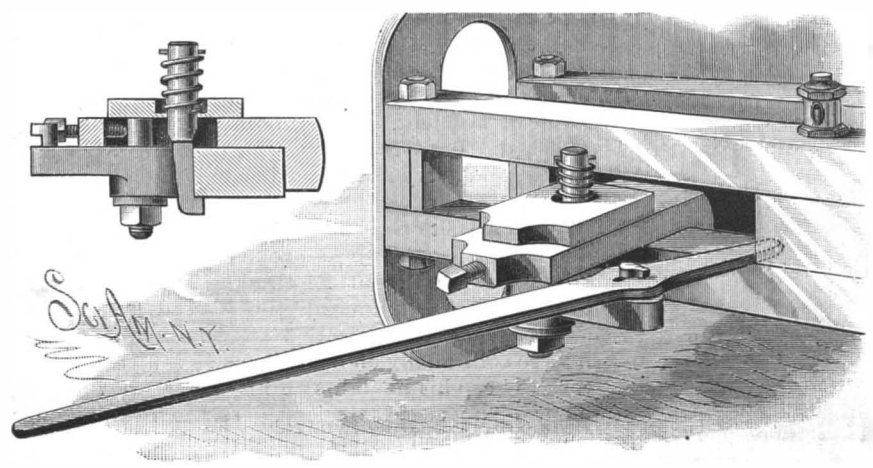
which is formed of tabs which are continuations of the ends of the collar, or are made separate and secured to the collar by sewing or otherwise. The ends cross each other, so that the points project downwardly and laterally, after the manner of a necktie. When a white collar is employed, and the tabs are made of the same material, they may be printed or otherwise colored in imitation of necktie material; or necktie material may be used, when the tabs are made separate from the collars. The front buttonholes are made in a diagonal direction in relation to the length of the collar, so that when the latter is buttoned they will assume a horizontal position on the neck.

This invention has been patented by Messrs. John S. Dove and John S. Dove, Jr. Particulars concerning the sale of the patent can be had by addressing the latter at 833 Reed Street, Philadelphia, Pa.

CROSSHEAD PUSHING DEVICE.

In a steam engine it is frequently necessary to move the crosshead and its connections without the aid of steam. The device herewith illustrated accomplishes this object, and is adaptable to the various shapes and forms of guide bars in engines and locomotives. The device consists, principally, of three parts—a clamp attachable to the guides, and having a reversible crank arm pivoted to it, and a lever fulcrumed on the crank arm. The clamp is provided with an angular bar, having a slot through which passes an angular clamping pin, on which is a coiled spring arranged as shown in the sectional view. A stud also passes through the slot, and is provided at one end with a plate having an aperture through which the pin and its spring pass. On the stud turns a crank arm, provided on its outer end with a pin having a lug. The operating lever is formed with an aperture and a notch, which fit over the pin and its lug, the latter preventing the removal of the lever when the lug and notch are out of line with each other. A set screw screws on the end of the angular bar and against the stud.

The operation of this device is as follows: The angular bar and clamping pin are fitted on one of the guides in which slides the crosshead to be moved. The pin can be adjusted to any thickness of guide, as the spring yields accordingly, and it can also be set to any width of guide by adjusting the set screw. The lever is then placed on the pin on the crank arm, so that its end rests against the crosshead, which can then be shifted by moving the long arm of the lever. As the inner side of the crank is slightly beveled, it acts as a cam against the clamping pin, and thereby holds the latter securely against the guide, and also prevents the crank from moving outward. The crank arm can be used on either side of the clamping bar. The crosshead can, by this means, be moved to any distance, forward or backward. This invention has been patented by Mr. William McIntosh, of Huron, Dakota.

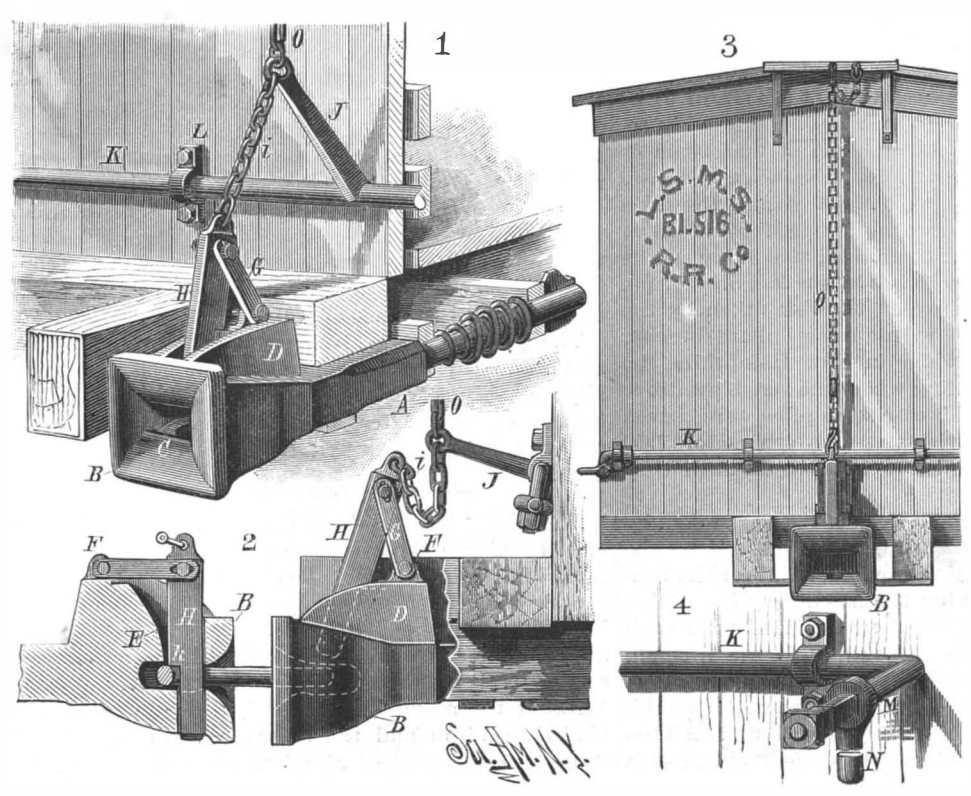


McINTOSH'S CROSSHEAD PUSHING DEVICE.

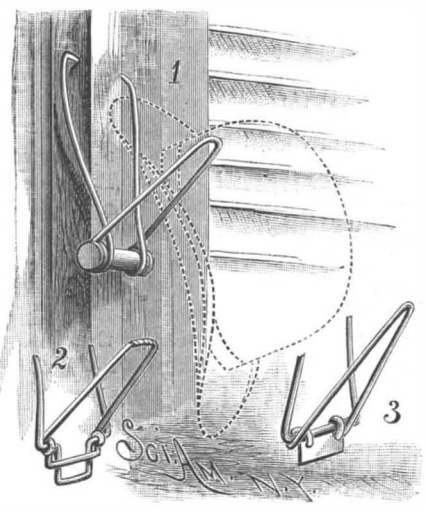
IMPROVED CAR COUPLING.

The car coupler herewith illustrated may be manipulated from either side or from the top of the car when uncoupling. The coupling of the cars is effected automatically, and when desired the coupling pins may be locked in their withdrawn position above the link recesses of the drawhead. The drawhead, B, is formed with a recess, C, which, as usual, has a flaring mouth. In the lower side of the recess, at the point of juncture of the recess proper and its flaring mouth, is an upwardly extending ridge, which is considerably higher than the bottom of the recess. Upon the upper face of the drawhead is a boss, D, through which passes a vertical recess, E, the rear wall of which forms a gradual curve from the link recess to a horizontal shoulder formed upon the upper face of the boss just in advance of a lug, F, through which is held a bolt that forms a support for two connecting links, G, as shown in the sectional elevation, Fig. 2. These links serve to guide and partially support the coupling pin, H, which is formed with a shoulder, *h*, and is connected by a small chain, *i*, to an arm, J, which is rigidly connected to a rock shaft, K, mounted in brackets on the end of the car. Each end of the shaft is bent to form lever arms, M, Fig. 4, provided with handles, N, so arranged that they may be thrown into or out of engagement with squared portions of the arms. The chain, O, Fig. 3, is provided in order that the brakeman, when standing on top of the car, may raise the coupling pin. The proper link of this chain may be placed over a hook, to hold the pin in a raised position. This hook is so formed as to have sufficient strength, or grip upon the chain, to hold the pin raised and at the same time to permit the release of the chain when pulled. It is not necessary, therefore, for the brakeman to be on the roof of the car in order to release the chain.

When the cars are to be coupled, a link is placed in one of the drawheads and arranged so that the shoulder of the coupling pin will rest upon its inner end (as shown at the left in Fig. 2) and cause it to extend outward at an upwardly inclined angle, the weight of the link being carried by the ridge in the bottom of the



STONE'S IMPROVED CAR COUPLING.



ATWOOD'S HAT HOLDER FOR TRAVELERS.

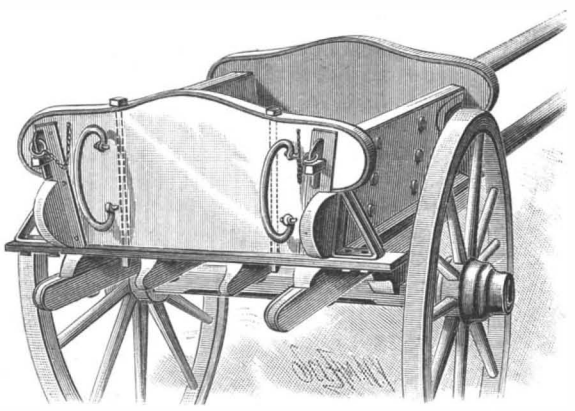
[FOR DESCRIPTION SEE PAGE 228.]

recess, C. The opposite coupling pin is placed in position, shown at the right in Fig. 2, with its shoulder resting upon the horizontal shoulder of the drawhead. As the cars come together, the shock or jar will dislodge the pin, which will fall through the link and couple the cars. To uncouple the cars, the rock shaft is turned to raise its arm, J, and withdraw the pin, and if it is desired to secure the pin against being accidentally returned to the link recess, one of the operating handles is moved so as to extend downward from its lever arm, when the shaft will be held to prevent its arm moving downward. It is evident that all the movements of this coupling may be accomplished from either side or from the roof of the car. In this form of coupler, owing to its solidity and the simplicity of its construction, as shown in the engraving, there is no liability of disarrangement and breakage, while in use there would be found less than the usual effects of wear.

This invention has been patented by Mr. Dudley G. Stone, of Negaunee, Mich., to whom railroad companies, car builders, and others interested may apply for rights of manufacture and of use.

IMPROVED DUMPING CART.

The object of this invention—which has been patented by Mr. T. J. Flanigan, of Butte City, Montana—is to provide a cart body that will successfully withstand the wear and tear incident to the carting of



FLANIGAN'S IMPROVED DUMPING CART.

stones and minerals, and the tail board of which may be readily removed when it is desired to dump the load. The rigidity and stability of the body are increased by auxiliary sills placed beneath the usual side ones, and the extending ends of which are bound with metal bands. The rear cross bar is of iron, and is securely connected to the sills and intermediate beams; to the projecting ends of this bar are secured braces which support the side boards. The forward end of the cart consists of a board held to the forward cross bar by bolts. The side boards are held to this board by U-bolts, secured to the outer faces of the side boards in such a way that their ends pass through the front board and receive nuts. The side boards and front board are bound by metal strips, and the tail board is bound with metal, and is held from checking or splitting by bolts passed through it; the inner ends of these bolts are elongated, so as to enter slots in the rear cross bar when the tail board is in position. The tail board is held in place by circular retaining irons secured to the side boards, and the ends of which pass through apertures in the tail board, and are slotted to receive pins connected by chains to the board. The outer face of the tail board is provided with handles. This cart, owing to its peculiar construction and numerous metal facing strips, and the metal cross bar at the rear, is well adapted to withstand the wear and tear due to the handling of minerals or stone.

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HAT HOLDER FOR TRAVELERS.

This hat holder is designed to be temporarily adjusted for use by travelers in railroad cars and other public conveyances. The device as shown in Fig. 1 is made of a continuous piece of wire bent to the form indicated. The free ends of the spring arms are bent toward each other, and pointed to enable the device to be readily secured to a moulding or other projection, by a slight pressure of the fingers. Passing through the spiral portions of the wire is a cross bar, which lends stability to the device and acts to steady it when fastened in position ready for use. The enlarged ends of the cross bar prevent it from being freed from the holder. The wire used is not very heavy, but possesses sufficient strength to allow the loop to be borne down to a suitable angle by the weight of the average hat. The spring action of the spirals is sufficient to return the loop to its normal position upon the removal of the hat. In Figs. 2 and 3 are shown modified forms, in which the spring arms and loop portions are made of separate wires bent to the shapes clearly indicated in the drawings.

This device, which is the invention of Mr. William H. Atwood, of Kinderhook, N. Y., forms a very reliable and convenient hat holder, which is especially useful for travelers, as it may be easily carried in the pocket when not in use. It is also well adapted for temporary use in theaters, restaurants, etc.

The Skeleton Industry in France.

A correspondent of the *Medical Press*, of London, communicates to that journal the following account of a skeleton manufactory which he recently had an opportunity of visiting. The establishment is located in the plain of St. Denis, France, and consists of large wooden buildings, comprising one main structure and several annexes.

The large hall contains two rows of immense kettles, the emanations from which are, as might be supposed, far from agreeable, even to an olfactory apparatus used to the atmosphere of a dissecting room. These kettles serve for ridding the bones of their adhering tendons, through boiling. The disarticulation of the skulls, which is performed separately, constitutes the most delicate part of the operation. In the case of children or young adults, it is effected through an ingenious process consisting in filling the cerebral cavity with dry peas, and then immersing the skull in water. Through the effect of such immersion, the peas swell and bring about a dislocation of the most delicate sutures.

A certain number of the kettles are reserved for carcasses of animals designed to furnish skeletons of a lower price than the human ones, but indispensable for the study of natural history, and forming an important article of Parisian export.

After the bones have been submitted to a prolonged boiling, they are carried to tables, where young women carefully scrape them, in order to free them perfectly from the soft tissues that adhere to them. Certain specialists obtain very high wages for this work, especially those who prepare very delicate bones, such as those of frogs, lizards, etc.

The fat that swims on the surface in the kettles is skimmed off with care, and put into a special vessel in one corner of the hall. What is its destination? That is a mystery.

After being scraped, the bones are bleached, either through the action of chloride of lime, for cheap skeletons, or that of the sun for high-priced ones. Finally, they go to a special work room, where they are assembled, mounted upon brass, and articulated.

These final operations require a profound knowledge of osteology, along with an artistic eye. In fact, it is necessary to select, from a collection of all sorts of bones, those that can be well enough assembled to look as if they came from one and the same individual. The others are sold singly, for the use of students of limited means, who are content with a portion of an unmounted skeleton. It is curious to find that sex has a great influence on the market value of the bones, a beautiful female skeleton being usually worth 20 or 25 per cent more than a male one of corresponding quality.

Special kettles are devoted to children, from those of the most rudimentary age up to those of two or three years. These skeletons are arranged in show cases, in ascending series, from the miniature three or four inches in height up to the baby of twenty or thirty inches. These little skeletons have proportionally a greater value than those of their adult brothers.

It may naturally be asked whence all the cadavers come. Most of them, it appears, are furnished by the hospitals and dissecting rooms, and others by the prisons. As a general thing, the supply has been less than the demand, but in recent times the abundance and cheapness of skeletons of Austrian origin have considerably depressed the market. Nevertheless, despite the industrial and commercial crisis that prevails throughout the world, the industry under consideration seems to be in a most flourishing condition.

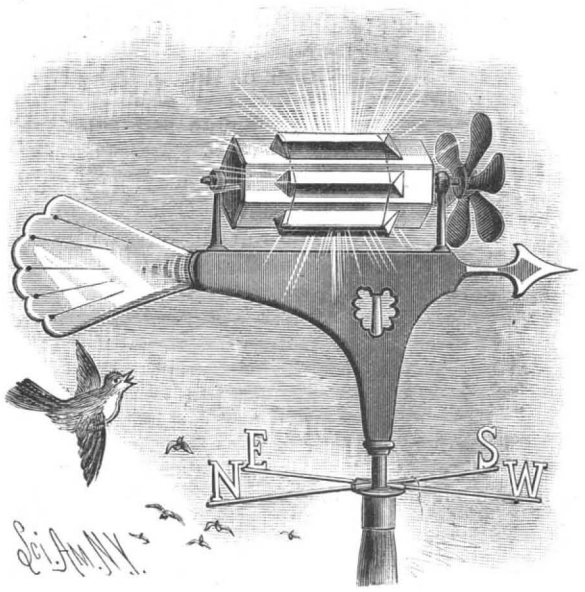
Water Back Explosions.

During the past winter quite a number of accidents have been reported from the bursting and explosion of the water backs to ranges. Among a number of remedies suggested for obviating such occurrences, the following, by a correspondent in the *American Architect*, possesses novelty, and may answer the purpose required of it.

The device consists of an air chamber made of corrugated sheet iron, placed inside of the water-back; when the water freezes, it will expand 0·089 of its bulk; and as the compressibility of air exceeds this by far, an air chamber of, say, one by two inches, in an ordinary size water back, will accomplish the object, and danger of bursting or exploding is averted, either from the expansion of ice or pressure of steam; to make sure, I have added a device in the shape of a plug placed in the top of the water back, held in its place by a spring, which will allow the plug to rise up under a certain pressure of steam, thus acting as a safety valve; when, then, the connections between the water back and boiler are made with lead pipe, instead of iron pipe, the writer adds, all danger of bursting or exploding is averted.

A NOVEL WEATHER VANE.

A decided departure from the ordinary type of weather vane may be secured very simply by following the construction shown in the accompanying engraving. A hexagonal barrel, with sides of mirrors, is mounted on its axis as shown, and a propeller or helix is connected with it at one end, whereby a rotary



REYNOLDS' NOVEL WEATHER VANE.

motion is imparted to the barrel by the action of the wind. Prisms are wired to the sides of the mirrors, which give to the rays a rainbow-like hue which is dazzling in the extreme. This contrivance has been devised by Mr. R. B. Reynolds, of Stockport, N. Y., and it possesses a novelty which will commend it to the attention of those seeking something quite unique in this line.

Mechanical Foolhardiness.

Carelessness kills more mechanics than old age or disease, and the number of accidents resulting from somebody's carelessness cannot be estimated. There is not as much danger in doing risky jobs and undertakings as there is in the every day risks which are met with a contempt brought about by a long acquaintance therewith, and which are hardly regarded as risks by the men who take them. The architect takes risks which are needless when he guesses at the strain to be overcome by beam or truss, and also, and doubly so, when he also guesses at the strength of that beam or truss. The builder in turn takes a risk when he passes defective construction with the guess and the hope that "'twill hold." In driving piling for a block of houses in Harlem, the writer noticed that some of the piles were driven 12 to 20 inches by the last blow of the hammer, and he wondered at the risk taken by the builder for the sake of saving a few dollars thereby. In building a railroad bridge in New Hampshire, the contractors put down piling where the last blow drove some piles 4 feet! In this case some piles were driven too far, whereupon the risky, rascally contractors laid hold of said piles and pulled them up again until they were in the required position.

In erecting buildings, hundreds of risks are taken by the workmen themselves, by the owners, and by the builders also. In erecting machinery, the risks continue to be taken, and after the machinery is running it seems almost as if the attendants vied with each other in courting danger. Begin with the fireman. How many times will he risk his life by guessing that the safety valve is in perfect order, or that the combination water gauge pipe is not plugged up! All too often he will guess that his boiler is safe, and run with dirt, leaks, corrosion, and he knows not what else, in that straining and groaning iron shell under which he shovels coal. Why is all this, we may well ask? Is the man a lunatic? Is the man a fool, or what is the matter with him? There are just two other causes which may affect his behavior, for he may be lazy or avaricious; then in this latter case he is a villain as well. The architect was lazy; he didn't figure because it was easier to guess. The builder who drove the piling was a knave. He did thus in order to make more money out of the job; but the workmen who got maimed or killed, the fireman who lets his safety valve get stuck, he is sometimes a fool, but more often these things happen through pure laziness, and laziness alone. The engineer who almost hourly exposes himself by walking under the expand belt from his engine, this man is lazy; but he is abetted in his laziness by knavery, in shape of an avaricious owner, who grudges the few dollars necessary to box up the dangerous place, and thus relieve the lazy man's temptation.

Lazy men run all sorts of risks in putting on belts, in fooling around moving machinery and in monkeying with running tools, such as circular saws, planers, and moulders. The man who crawls around exposed machinery to oil or clean the same, when he can just as well stop the machine before exposing himself, this man deserves to be sent up for ten days for every offense. Only a few days since, a party of masons were building a 100 foot mill chimney. They had got up 18 feet, when all at once the whole party thought an earthquake had come to help them. They were all on the ground among bricks, mortar, and splintered lumber, with two of their number seriously hurt. An examination showed that in nailing on the last course of ledgers, only one nail had been put into some of the posts where six should have been driven. Here was a clear case of laziness and foolishness combined, with the poor consolation—to the victims at least—of knowing that only themselves were to blame. Sometimes this carelessness becomes criminal, and is occasionally brought to justice; and lately, where knavery is the cause of accident, it has been frequently severely punished. There is no excuse for exposure to such accidents, and every man can educate himself out of it if he will.

Familiarity is one great cause of a man getting careless and lazy. He works around machinery so long without accident that he thinks, if he thinks at all about it, that he knows all the ins and outs, all the dangerous places and death traps, so he will not have to be so continually on his guard. It is a good deal of work to keep his thoughts on his fingers all the time, so our man gets a little lazy, goes too near a quick running belt, and the first thing we know he is a subject for the surgeon or undertaker. Well, the writer remembers a man who was set at work running a circular saw. This man was mortally afraid of the saw, and kept as far from it as possible. For twenty-three years the saw was operated by this man without accident, until one day he dropped his rule beside the saw, and attempted to pick it up without going back to the table. He got three fingers and his thumb cut off, all through a little laziness in not taking proper pains against accident.—*J. F. Hobart, in the Boston Journal of Commerce.*

Poisoning by Locust Tree Bark.

The inner bark of the fragrant flowered locust (*Robinia pseudacacia*), commonly cultivated as an ornamental tree and for its invaluable timber, has long been known to have a sweetish taste resembling that of licorice, and to have emetic and cathartic properties.

In the *New York Medical Journal* of January 22, Dr. Z. T. Emery reports a case of poisoning of thirty-two boys at the Brooklyn Orphan Asylum, from chewing some of this bark, which they had obtained from the yard, where fence posts had been stripped.

In the mildest cases, vomiting of ropy mucus was observed, together with flushed face, dryness of throat, and dilated pupils. In the severest cases, large quantities of ropy mucus mixed with blood were vomited. The other symptoms were retching, pain in the epigastrium, debility, stupor, cold and pulseless extremities, a feeble and intermittent action of the heart, dilated pupils, and face of a dusky pallor.

The patients were given subcarbonate of bismuth and brandy by the mouth, and morphine hypodermically; sinapisms were applied over the stomach, and bottles of hot water along the extremities. The patients were discharged from the hospital in two days.

ALUMINUM STEEL.—The Cowles Electric Smelting and Aluminum Company, of Cleveland, O., are now exhibiting what they call aluminum steel. In a sample bar of iron welded to a bar of Siemens-Martin basic steel with one-fifth of 1 per cent of aluminum added, no line of weld can be seen, the characteristics of the steel appearing to extend far into the iron. Without the aluminum, a clearly defined weld is visible between iron and the same steel. The same firm show a forged bar of aluminum bronze, with 5 per cent of aluminum. This broke at 36 tons per square inch of original section, with 60 per cent elongation.

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Analyzing the Air.

We learn from the *Sanitary World*, London, that an analysis is about to be made of the air in the schools, public halls, theaters, and some of the churches of Edinburgh. In several cities, both on the Continent and in Britain, the custodians of the public health have had the air of places of public resort analyzed; and now through the efforts of Dr. Russell, the convener of the Public Health Committee, the same is being done for Edinburgh. The first examination was made in the rooms of the council chamber recently. The apparatus used in the process is contained in a large box. Three different sets of apparatus are employed—one for testing for carbonic acid gas, a second for germs, and the third for organic matter. In connection with the analysis for carbonic acid, the air is pumped by a bellows into bottles with a capacity of a gallon and a half, the air from different heights being obtained by means of an adjustable India rubber tube. In the analytical process a solution of baryta is used. This poured into the bottles containing the air absorbs the carbonic acid, and forms a white powder at the bottom of the vessel. A given quantity of baryta being capable of absorbing a given quantity of carbonic acid gas, the measurement of the baryta remaining in solution in the bottle gives, on a simple calculation, the quantity of carbonic acid gas which was in the amount of air sampled. For the collection of those mysterious germs which are never entirely absent from the atmosphere, and whose functions have not yet been satisfactorily determined, a glass tube about 2 inches in diameter and 2½ feet in length is used. This, coated internally with a transparent gelatine, in which the germs can live and thrive, is brought to the place the air of which is to be tested, germ free. A reversing aspirator is affixed to it, and a measured quantity of air is then drawn through the tube, on the sides of which the germs deposit themselves. At first these are not distinguishable by the naked eye; but in the course of three or four days they have formed colonies and multiplied so exceedingly that a glass is no longer needed to pick them out. Ultimately they are subjected to examination under high microscopic power, so as to determine, if possible, their genera, and whether or not they are disease-producing germs. They are mostly vegetable, and belong to the very lowest order of things endowed with life. For determining the amount of organic matter, the apparatus used consists of a set of six bottles filled with the purest distilled water, and connected together by means of tubes. The aspirator is put on to one end, and the air is then sucked into the bottles drop by drop, and thoroughly washed in its passage through them. No perceptible discoloration of the water ensues by this washing of the air, but the water acquires a stuffy, disagreeable smell, the same as is experienced in a badly ventilated chamber. The water thus impregnated with organic matter is then emptied into a vessel for analysis. These investigations are being made by Dr. Hunter Stewart, who directs under Sir Douglas Maclagan the Public Health Laboratory in the University, and by Mr. Cosmo Burton, B.Sc., well known as an analytical chemist.

The New Steel Gun.

The army ordnance officials are quite jubilant over the results obtained last week at Sandy Hook with the new 8-inch steel gun, which was recently hooped to the muzzle after having been fired successfully 24 rounds. Since the rehooping, the gun has been fired 19 rounds, making 43 rounds in all. The ordnance officers who witnessed the trial report that during the last firings the gun, with a powder charge of 110 lb. and a 289 lb. shot, gave the following results: Initial velocity, 1,878 ft.; pressure, 36,000 lb. per square in.; energy, 7,066 ft. tons. With a 302 lb. shot, the powder charge and density of loading being the same, the results produced were: Velocity, 1,857 feet per second; pressure, 37,000 lb. per square inch; and energy, 72·19 foot tons, which is equivalent to an energy of a shot of 289 lb. weight with a velocity of 1,898 feet per second. These results are considered equal to those given by the Krupp 8¼ inch gun, and considerably in advance of anything produced by guns of similar dimensions. Still better results are anticipated with improved powder. The gun went through the last firings without a blemish, the breech mechanism (the De Bange system) working admirably. —*Army and Navy Jour.*

Transparency of Molten Iron.

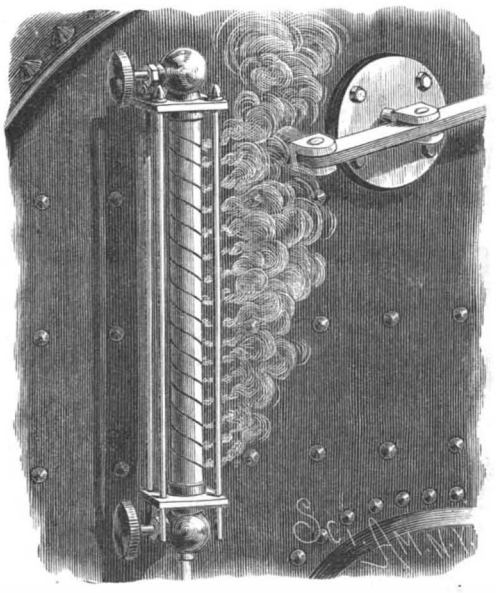
A correspondent of the *Chemical News* says: Some days ago I was present when a casting was made involving the pouring of several tons of molten cast iron. The stream was very regular, and resembled a great waterfall. It was possible to see objects through the molten metal, which appeared to be of a yellowish color, but tolerably transparent. Two gentlemen who were present were also convinced of the transparency of the metal. May I ask, through your columns, the opinion of those who have frequent opportunities of being present during the operation of casting, regarding this seeming transparency?

Correspondence.

CURIOUS ACCIDENT TO A WATER GAUGE OF A LOCOMOTIVE.

To the Editor of the Scientific American:

I inclose you photograph of water gauge glass which was cut while in service, in the spiral form shown, the steam and water escaping through the cut. Engineer H. Bokeloh, of engine 19, C., I., St. L. & C. Railroad, tells the following story: December 15, 1886, I had occasion to take the glass from its sockets while under steam, replacing it upside down. As soon as steam was turned on, opening lower waste cock, a small particle of something passed through, cutting the glass and escaping through the cock with the waste steam. I could not find what it was. When the cock was closed, the water and steam escaped through the whole length of spiral. It is considered a great curiosity here; many veteran engineers have "given it up," and say they can give no solution to the mystery. The glass is kept, with a photograph of same, in Master Mechanic Patterson's office, Cincinnati, where it is daily inspected by many engineers.



GEORGE B. HAVENS.

Indianapolis, Ind., January 24, 1887.

[It is well known among dealers that many of the Scotch water gauge glasses are under internal strain from deficient annealing. The least scratch will cut them like a diamond. They sometimes split after being cleaned with cotton waste on a wire or small iron rod, the contact of the wire or rod causing fracture. The point of a small file run around on the inside cuts as clean as a diamond. In the case of the spiral cutting written of by our correspondent, and represented in the accompanying engraving, the steam or water, in entering the tube, takes a spiral movement from some peculiarity in the opening in the cock or valve, as is often observed. Any scale or hard substance entering with the steam or water will partake of the whirling motion of the steam or water as it progresses through the tube. If the scale by its gravity acquires a centrifugal force that throws it against the tube and keeps it there, through the whole course of the spiral movement of the steam or water, this may be sufficient to cut the spiral track shown in the engraving, which is a careful copy of a photograph of the glass itself.—ED.]

Exposure as a Preservative of Health.

To the Editor of the Scientific American:

In the army we had for tents rectangular pieces of canvas four feet square, two of which, joined at the edge, and supported upon sticks in the form of a V-roof, formed a shelter for the night. Under these we slept on blankets placed upon the ground, and such perfect, strength-renewing, and invigorating sleep I never experienced before nor since. A mere canopy over us, with the winds blowing across our faces during the night at their own sweet will. I scarcely knew then what it was to have a cold. I have been filled with astonishment at times, when realizing what exposures I endured without the least inconvenience as to health.

I have lain upon blankets upon frozen ground at night, and awakened in the morning to find the blankets wet from the mud beneath me, caused by the ground thawing from the heat I had furnished during the night. I have repeatedly, at the close of a long, tedious march, lasting until late in the evening, lain down by the side of a fence in clothes wet with perspiration, with boots for a pillow, and without covering, and slept refreshingly, to wake in the morning in rain that had been falling I knew not how long. Under such extreme exposures I would sometimes arise with a slight hoarseness—nothing more—which would disappear before noon. My experience was not different from that of others around me, and how any of us passed through these things and lived twenty-four hours thereafter has never ceased to be a mystery to me. A person worn and exhausted from hard labor is peculiarly fitted to become the victim of colds and rheumatism, if exposed to dampness and chilly air, and yet these were the very conditions under which we, at the end of a laborious march, would seek the comfort the ground gave us, too weary to give much thought to the matter of protection. Troublesome chilblains that had afflicted me since childhood entirely disappeared. War life will, I believe, kill one man out of twenty and make robust, healthy men of the other nineteen.

After our discharge, the first night's sleep in a house found us suffering from colds, in some cases truly severe, and I have always believed since my army experience that man, as an animal, has no business in-doors, where health-destroying draughts are creeping along the floors and walls. The recent correspondence in the SCIENTIFIC AMERICAN on this subject has brought vividly to mind my army experience.

E. B. WHITMORE.

Rochester, N. Y., March 24, 1887.

Rotation of a Solid within a Fluid.

To the Editor of the Scientific American:

The account of Rougerie's "Anemogene," which you have republished from *Engineering*, is interesting as a device for illustrating the effect of centrifugal force due to rotation of a solid within a fluid; but M. Rougerie's idea that the rotation of the earth is an important factor in giving rise to the great currents at its surface is by no means new. The statement in the article is, "We must bear in mind that the ordinary assumption explains these as arising from differences in barometric pressure due to differences in temperature, while M. Rougerie bases his theory on differences in air pressure directly due to the rotation." This seems to imply that his theory is deemed a new one.

Professor William Ferrel, who was connected for many years with the United States Coast Survey, and then with our national weather bureau, from which he withdrew on account of ill health only a few months ago, was the first to apply to meteorology the principle that M. Rougerie illustrates now so ingeniously. His paper on "The Motions of Fluids and Solids on the Earth's Surface" was published in *Runkle's Mathematical Monthly* during the years 1858 to 1860, the general course of reasoning employed by him having been first given in a popular article, published in 1856, in the *Nashville Journal of Medicine and Surgery.* It was reprinted in 1882 as No. VIII. of the professional papers of the United States Signal Service. It bristles with mathematical equations, and probably on this account the results attained by him have not found their way into the popular text-books. Professor Guyot was probably familiar with them, but did not undertake to popularize them in his school text-book of physical geography, which is largely used in this country. In all of the text-books on this subject, the rotation of the earth is taken into account in explaining the westward tendency imposed upon the fluids at the earth's surface in equatorial regions, and the eastward tendency as they return toward the poles, this deflection being from motion in a north and south line.

Professor Ferrel showed that "*in whatever direction* a body moves on the surface of the earth, there is a force arising from the earth's rotation which deflects it to the right in the northern hemisphere, but toward the left in the southern." The usual explanation of the trade winds is an application of only a part of Ferrel's law. This law includes what M. Rougerie illustrates with his anemogene. It is the foundation for the explanation of not only the trade and anti-trade winds, but of the currents of the ocean and of the spiral motion of the air in cyclones. The fact of such spiral motion is always mentioned in the school text-books, but there is usually very little in the way of explanation of this or of their approximately parabolic path.

In the article about M. Rougerie, it is stated that "somewhat fancifully he assumes, in analogy with the rings of Saturn and the belts observed on Jupiter, that our atmosphere extends to a greater height at the equator than at the poles, so that the earth should carry with it a sort of atmospheric ring." This "fancy" was, thirty years ago, developed mathematically by Professor Ferrel, whose conclusion that the poles must be regions of relatively low barometric pressure has been verified by subsequent observation, as may be seen by examining any recent isobaric chart of the world. The truth is not that Wojeikof's observations are explained by Rougerie's subsequent theory, but that they were preceded by Ferrel's general demonstration.

Important as the earth's rotation is in determining the fluid currents at its surface, its effects are so bound up with those due to the sun's heat that no separation is possible. Nor can we ever decide whether Rougerie is right in according to the sun's rays "only the second place."

M. Rougerie is not alone in having constructed a model to show the effect of rotation, along with continental interference, in producing currents that circulate somewhat irregularly over the earth's surface. As far back as 1866, I saw one in which the fact was satisfactorily demonstrated. W. LE CONTE STEVENS.

Brooklyn, March 24, 1887.

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The New Thames Tunnel.

A representative of the *Pall Mall Gazette* having visited the new tunnel in course of construction between the Monument and the Elephant and Castle, gives the following account of this remarkable work:

One striking feature of the new subways is their depth. They run right down underneath water and gas mains and sewers, and almost wholly keep to the line of the public thoroughfares, so that the projectors are not handicapped by heavy compensations, at one point only payment having been made. The depth under the roadways ranges from 40 feet to 45 feet, and under the Thames it is about 15 feet. Starting from the terminus, which will have a commanding corner position immediately above the Monument, the tunnels extend across the road, and passing down Swan Lane, they enter the river bed at the Swan pier, about 50 yards above London Bridge. There are two independent tunnels, one for the up and the other for the down traffic, and as Swan Lane is very narrow, there was no space to place them side by side without encroaching on the contiguous property. The engineer has overcome the difficulty by running one over the other with about 5 feet of earth between, and gradually the lower one is raised until they run parallel, but separated by about 5 feet.

The work is being carried on from a temporary shaft sunk at the Swan pier, with a depth of 60 feet to the first tunnel and 75 feet to the second, and having a diameter of 13 feet. Down this shaft we were swung, and at the bottom we found ourselves in a long iron cylinder 10 feet in diameter. At present it is dimly lighted with gas and lamps, but we could see ahead for a considerable distance, the tunnel taking a straight line. A temporary tramway for the removal of the excavated material, and for carrying forward the iron plates with which the cylinder is built up, runs along the whole length of the subway. We found the path somewhat treacherous, for the passage of the greasy clay had made the boards very slippery. We arrived at the extremity, however, without mishap, and in a slightly heated atmosphere watched operations.

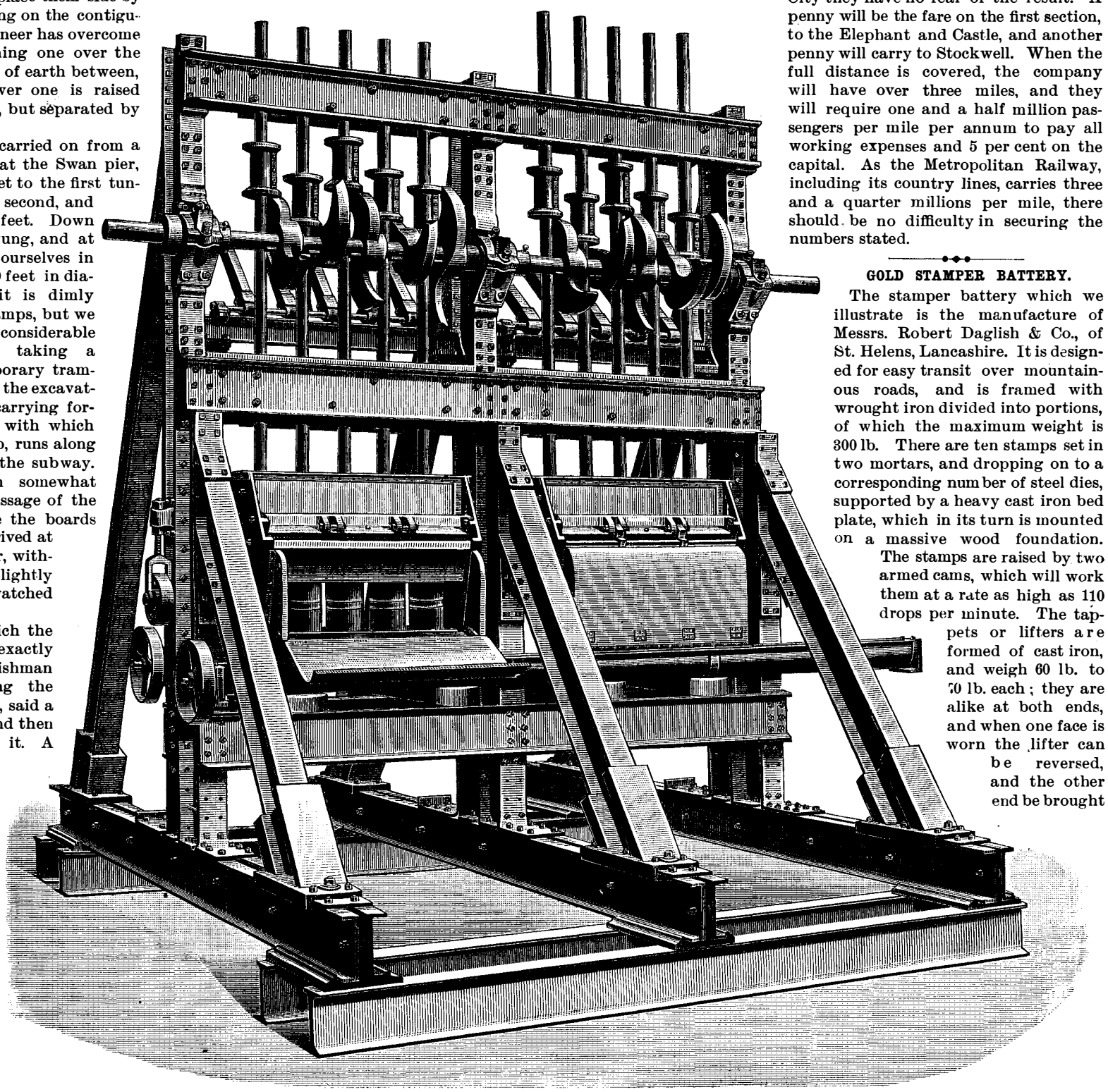
The principle on which the tunnel is made was exactly pictured by the Irishman who, when describing the manufacture of a gun, said a hole was first made and then iron was put round it. A hole is cut into the clay, and then piece by piece the cylinder is built up. And in this connection it may be noted that the London clay through which the subway will run its whole course is admirably adapted for the work, but at the same time sand or other loose soil can also be tunneled with a slight change in the machinery and method. First of all, a small heading is driven into the clay, and supported by timbers. With pick and shovel about 18 inches of the soil to the extent of the tunnel's circumference is next taken out, and then the "shield," as it is termed, begins work. This might be likened to the cap of a telescope, the telescope itself representing the tunnel in which the men are at work. Steel cutters are fixed round the outer edge of the cap (to maintain the simile), and hydraulic pressure (500 lb. to the square inch) is brought to bear upon it from within, driving it into the clay. The hole which was partially made by hand labor is thus rounded off, and the "shield" has been pushed forward in less than a quarter of an hour 18 inches. The "cap" is not wholly off the telescope, however. A plate of iron affixed to the "shield" covers the space bored until another section of the tunnel is added. Thus section after section is built up as the progressive movement is effected.

The circle is made up of six pieces, with a key piece at the top. They are 18 inches wide and 1 inch thick, with flanges through which they are securely bolted together, and weigh about 4½ cwt. each. The metal is cast iron, which will not corrode. The tube fits exactly to the shape of the hole which the "shield" has cut, less the thickness of the iron plate which the cap of the telescope typifies in the description. As the shield goes forward this hollow is filled with "grout" or liquid lime, which is forced through a hole in the iron plate by pneumatic pressure, and it very soon solidifies. There can thus be no risk of instability by the subsidence of the soil. In the matter of strength the engineer gave it as his opinion when the bill was before Parliament, the question of weakening the foundations of London Bridge having been raised, that forty London Bridges piled on the top of each other would not damage the cylinder.

Something like 10 feet can be driven each day, and in sixteen weeks the Thames was tunneled. The contrast with the ancient methods is amazing. The first Thames tunnel occupied about eighteen years, and although recent works have been more expeditiously completed, they have been much more prodigal of time than the one under review. The cost, also, can bear no comparison. 200,000*l.* per mile is regarded as the ultimate cost, and including stations, land, and indeed every outlay, the authorized line of 1½ miles will be completed for 300,000*l.* Hydraulic lifts will raise and lower the passengers at the stations, of which there are to be three, the intermediate one being at St. George's Church in the Borough, where the car traffic for the City is emptied. If the extension beyond the Elephant and Castle is approved, stations will be placed at Kennington Park, Kennington Oval, and the terminus at Stockwell. This would add 1¾ miles to the line, which would mean an additional outlay of 250,000*l.*, or 550,000*l.* in all for 3¼ miles.

All the details of working the line are not complete, but trains of three or four carriages somewhat after the style of a tram or Pullman car will be run, the motive power being the endless cable. The cars will be more roomy than omnibuses or even ordinary railway carriages. A driver and conductor will be in charge of each train, which will carry about one hundred passengers. The carriages will be about 6 inches from the top of the tunnel, and about 1 foot 6 inches, measured from the center, at the sides. They will start every two or three minutes, and the distance over the first section will be covered in six or seven minutes. The speed will be about double that of road conveyances. The machinery for working will be placed at the Elephant and Castle. With respect to ventilation, the engineer anticipates no difficulty. There will be no foul smoke from engines, as in the case of the underground, and, as the trains in each tunnel will always be running in one direction, they will create a current of air. If that, however, is not thought sufficient, a fan can be placed at the intermediate station, and by the expenditure of one horse power the atmosphere in the whole of the subway can be changed every hour.

The promoters of the line, of course, believe it will pay. They are going in for cheap fares and fast conveyance, and with the enormous traffic to and from the City they have no fear of the result. A penny will be the fare on the first section, to the Elephant and Castle, and another penny will carry to Stockwell. When the full distance is covered, the company will have over three miles, and they will require one and a half million passengers per mile per annum to pay all working expenses and 5 per cent on the capital. As the Metropolitan Railway, including its country lines, carries three and a quarter millions per mile, there should be no difficulty in securing the numbers stated.



IMPROVED STAMPER BATTERY.

GOLD STAMPER BATTERY.

The stamper battery which we illustrate is the manufacture of Messrs. Robert Daglish & Co., of St. Helens, Lancashire. It is designed for easy transit over mountainous roads, and is framed with wrought iron divided into portions, of which the maximum weight is 300 lb. There are ten stamps set in two mortars, and dropping on to a corresponding number of steel dies, supported by a heavy cast iron bed plate, which in its turn is mounted on a massive wood foundation.

The stamps are raised by two armed cams, which will work them at a rate as high as 110 drops per minute. The tappets or lifters are formed of cast iron, and weigh 60 lb. to 70 lb. each; they are alike at both ends, and when one face is worn the lifter can be reversed, and the other end be brought into use. The stamp head or socket is cylindrical, and is strengthened by wrought iron bands shrunk on. The stems run through guides of green-heart timber constructed in halves, so that they may be adjusted for wear.

The crushed ore, in the dry process, passes through screens of woven wire, varying in fineness from 900 to 10,000 meshes per square inch; in wet working, the screens are plates perforated by punches varying in size from No. 0 to No. 10 common sewing needle. The crushed ore falls into worm conveyers, by which it is delivered to whatever type of amalgamating apparatus may be employed. The conveyers are driven by a belt which is kept taut by a tightening pulley.

The perspective view shows the stamper framed in the makers' shops in this country, while the detail views illustrate the additional timber work to be fitted to it at the mine.—*Engineering.*

THE body of a nine-year-old girl has recently been cremated at the crematory near Pittsburg.

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Mixture for Writing on Glass.

The preparation for writing on glass called "diamond ink," says the *American Druggist*, is to be used with a common pen, and at once etches a rough surface on the parts of glass it comes in contact with. It proves to be a very useful article for labeling bottles which are to contain liquids that will destroy common labels.

At the request of Professor Maisch an analysis was made, which proved it to be prepared ammonium fluoride, barium sulphate, and sulphuric acid. The barium sulphate seems to act as an absorbing medium, and when the semi-fluid mass is used, it makes a white mark and prevents the spreading of the watery liquid; it also seems to make the acid etch a rougher surface.

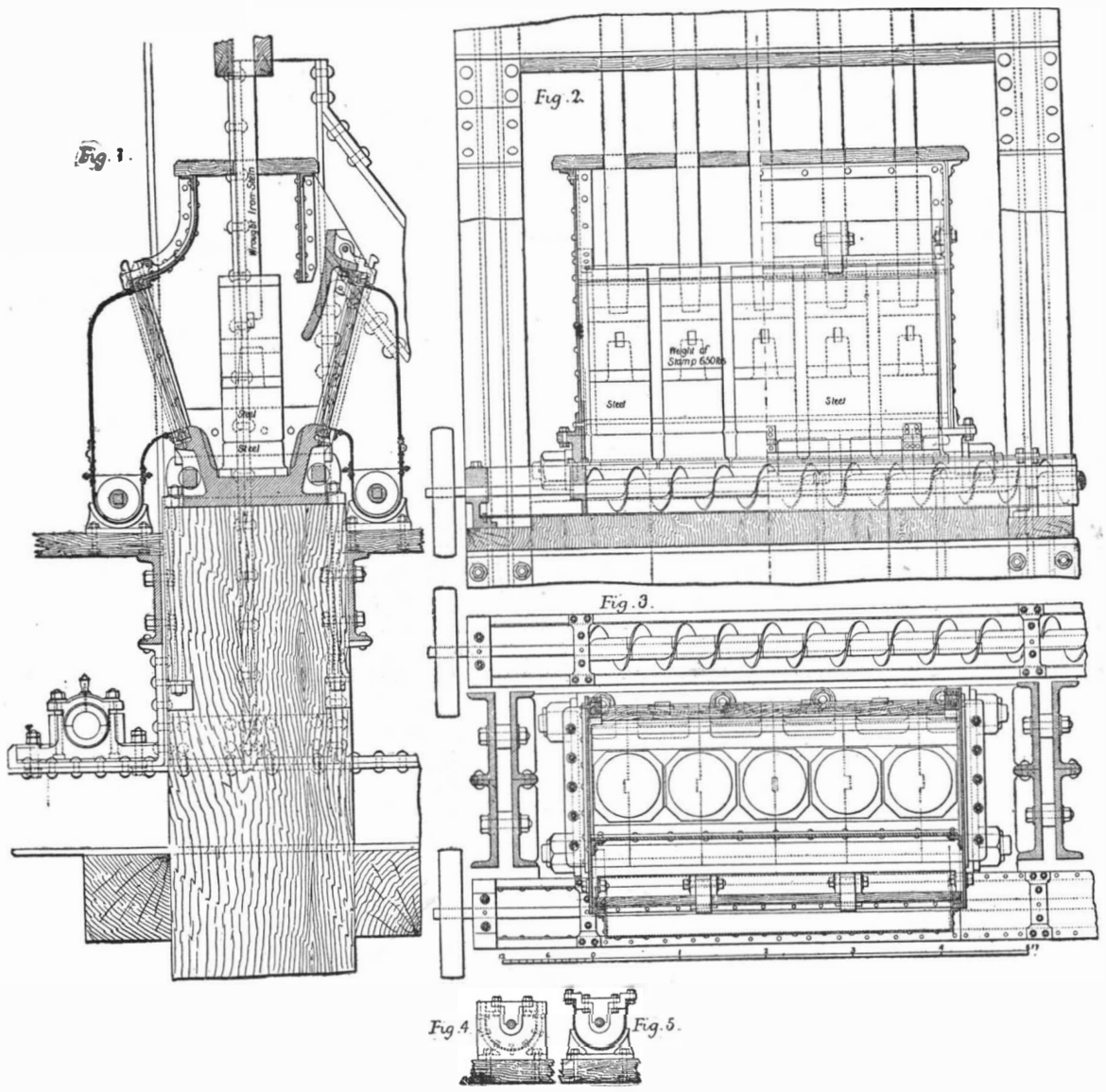
It is made by mixing barium sulphate 3 parts, ammonium fluoride 1 part, and sulphuric acid a quantity sufficient for decomposing the ammonium fluoride and making the mixture of a semi-fluid consistency.

The sample examined was contained in a glass bottle holding nearly two fluid drachms, and which was thickly coated on the outside with asphaltum, on the inside with a thick stratum of beeswax, and was stoppered with a rubber stopper.

It is claimed by the manufacturer that the mixture contains no hydrofluoric acid and does not corrode a pen; but of course it does corrode a pen, and hydrofluoric acid is the one thing that does the etching. Any one making this mixture and wishing to keep it in a glass, may coat the bottle inside with paraffin, beeswax, or rubber. It should be prepared in a leaden dish, and is preferably kept in a gutta percha or leaden bottle.

NOVEL METHOD OF PROTECTING VESSELS AGAINST TORPEDO ATTACKS.

The idea that a small torpedo or torpedo boat can most effectually and thoroughly destroy the largest ironclad afloat, if the explosion takes place immediately against the hull of the vessel, is extremely general. The protection of the hulls of these vessels against attacks by submarine torpedo boats has, therefore, received wide attention, although it does not seem that the art, so to speak, has advanced as far as that of the torpedo; and if this be the case, much remains to be done before these powerful little annihilators can be considered contemptible. The accompanying engraving clearly illustrates a method—proposed by Mr. E. F. De Celis, of Los Angeles, Cal.—by means of which a vessel may be warned of the approach of a submarine torpedo. Briefly, this plan consists in providing the hull with a series of bull's eyes below the water line, through which a powerful light may be thrown to illuminate the surrounding water. Alongside of each bull's eye is a glass-covered opening, through which a close watch of the water may be maintained, and the approach of a torpedo noted. Commenting upon the probable effectiveness of this method, Mr. De Celis says: "Is there anything to prevent it (the ironclad) from exploding the torpedo or torpedo boat by means of a dirigible torpedo before it comes within the proper distance to do any harm? This device can be applied at very small cost to any vessel," and "now that 'Uncle Sam' is going into ship building for war purposes, it would not be a bad idea to suggest this *possible* improvement for the *to be* men-of-war."

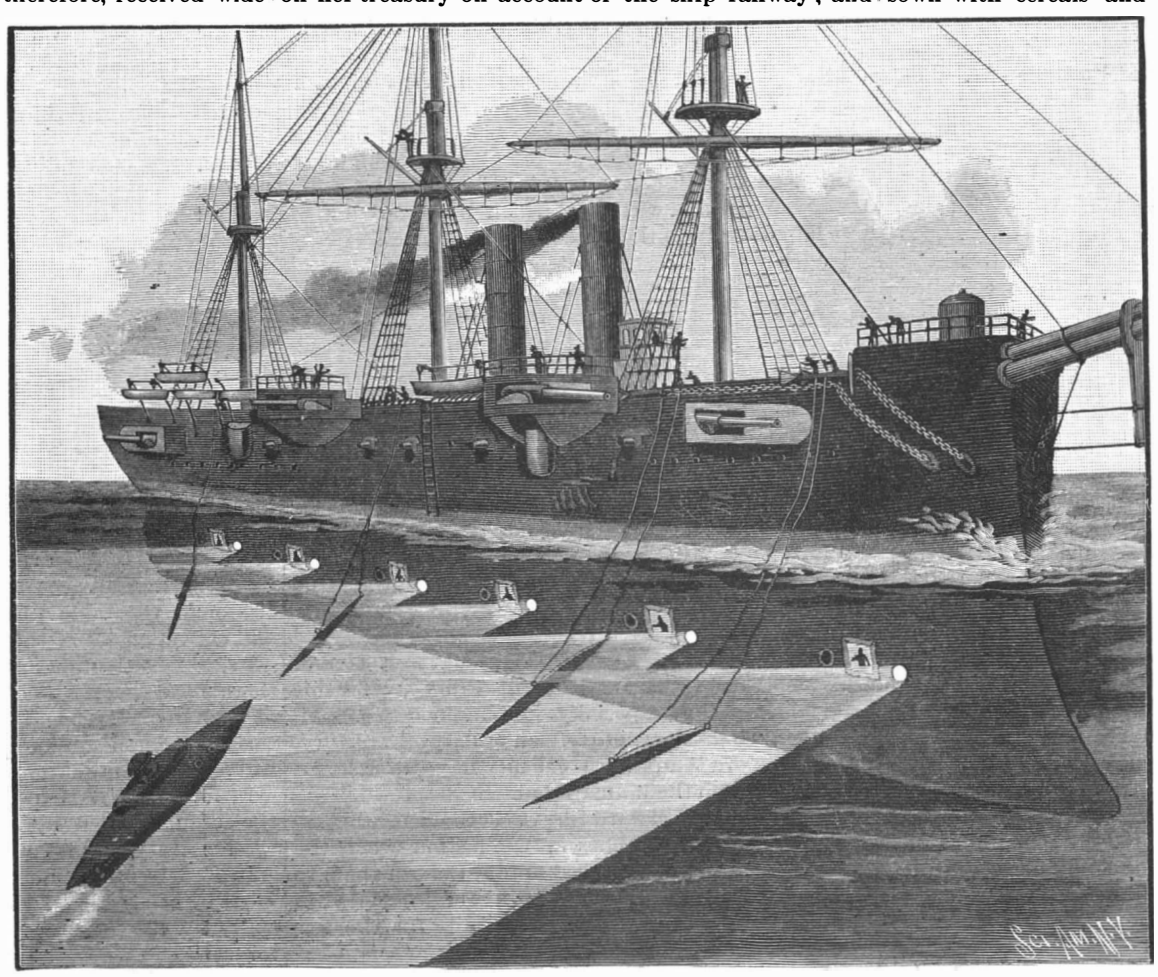


IRON FRAMED STAMPER BATTERY.

The Tehuantepec Ship Railway.

"Should the House of Representatives at Washington pass the Senate bill incorporating the Ship Railway Company, this huge scheme will be then presented to the attention of the great capitalists of the world, and, as the plans of Captain Eads have received the cordial approval of a great number of eminent naval engineers and competent constructors, it may be considered as certain that he will meet with a respectful and attentive hearing. Now that Captain Eads and his friends have abandoned the scheme of a joint governmental guarantee, Mexico may be regarded as entirely released from any future demands on her treasury on account of the ship railway; and certainly, if private capital shall undertake the building of this latest wonder of the world, Mexico can afford to favor the enterprise in every legitimate way without spending any money thereon. Under the provisions of the bill passed by the Senate of the United States, the capital stock of the Ship Railway Company is fixed at $100,000,000, of which ten per cent must be subscribed and $1,000,000 paid in cash before a meeting of the directors is held and certificates issued. Bonds are not to be authorized, or issued, until the paid up capital amounts to $5,000,000. There is, of course, under this arrangement, no mention of a government guarantee of interest payments. We are glad that the scheme has been taken out of the domain of governmental guardianship, for, if the plan be a sound one, there are plenty of bold investors who will furnish the money to construct what we believe will be a formidable rival to De Lesseps' ship canal at Panama. It is quite within the domain of probability that Captain Eads will be conveying ships across the narrowest part of Mexico many years before De Lesseps will be towing ships through his great ditch at the more southern isthmus."

The above is from the *Mexican Financier*, the most influential newspaper in the interests of banking, railroads, and commercial affairs published in Mexico. The death of Captain Eads may retard the ship railway enterprise, but there are other living promoters of the enterprise, who are energetic and determined on carrying forward the work so well begun by Captain Eads.



SUBMARINE LIGHT FOR TORPEDO BOAT.

Artesian Wells in the Desert.

Respecting the plan of Colonel Landas for fertilizing the African desert by means of wells, Sir R. Lambert Playfair, in the course of a consular tour in Tunis, has visited the ground where the first well was sunk, and reports most favorably as to the success of the project. A space of 375 acres has been cleared, and sown with cereals and lucerne, a vegetable garden been made, and a nursery of young trees planted. Two other wells are being sunk, which on completion will irrigate 7,500 acres of land. The Bey of Tunis has conceded to the company 25,000 acres of land, which they can select themselves from districts which are at present of no value.

Freezing Mixture.

A liquid invented by Raoul Pictet, of Geneva, Switzerland, for use as a disinfectant, answers well as a freezing mixture for hardening microscope specimens. Sulphur dioxide and carbon dioxide, having been mixed and cooled, are compressed until they are liquid, and stored in siphons. When liberated, they rapidly evaporate with great reduction of temperature. By this means mercury may be frozen, and animal or vegetable tissues rendered solid in a few seconds. It is as easily managed and more effective than ether, the odor being the principal objection.

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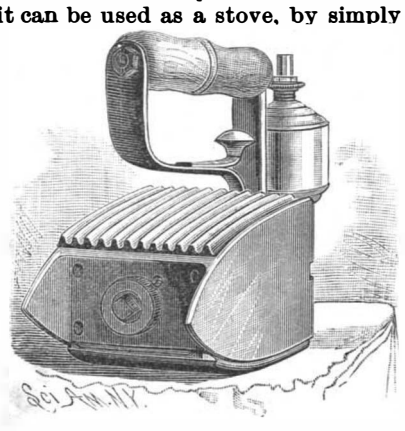
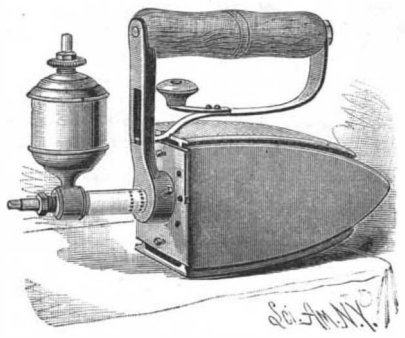
SELF-HEATING REVERSIBLE SAD IRON.

The engravings herewith presented show the different forms and combinations to be made with one of the reversible self-heating sad irons, and attachments belonging thereto, which has been recently invented by Mr. A. F. Chable, of Evansville, Ind. The iron is extremely simple in construction and practical in operation. As it requires no wick of any kind, trimming is never needed, and the disagreeable task of inserting a new wick in the lamp is done away with. It is safe and economical. Either gas, naphtha, gasoline, or alcohol can be used as fuel. Placed longitudinally in the body of the iron, the shape of which is clearly shown in the engravings, is a perforated tube that equally distributes the gas or vapors in the iron, generated from the burner of the lamp. The gas or vapor issuing from the tube may be ignited by inserting a lighted match in the iron, and the intense heat then produced in the chamber rapidly heats the faces of the iron. The body may be turned about the tube as an axis to bring either face into position for use, and is held in place by a suitable catch. The flow of the burning fluid from the reservoir can be adjusted with a key, so as to regulate the amount of heat as desired. There are four smoothing, two fluting, and two polishing irons. Two of the smoothing irons constitute two opposite sides of the body, and to the other two sides either of the above combinations can be readily attached. One most important feature of this iron is that it can be used as a stove, by simply locking the handle to the side and fastening the lamp in an upright position. By removing one of the detachable parts, any ordinary cooking vessel can be placed on the iron directly over the flame. This renders the device of great service in the sick room or nursery, where a hot fire is often needed quickly. The lamp is easily detached, and can be used for many different purposes, such as heating soldering irons, brazing small articles, tempering tools, thawing out frozen water and steam pipes, burning insects out of trees, etc.

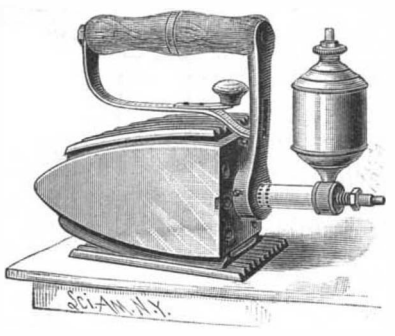
This invention has been patented in the United States, Great Britain, and France. All further information concerning the manufacture and introduction of this article on royalty, or concerning the sale of the patents, can be had by addressing the inventor as above.



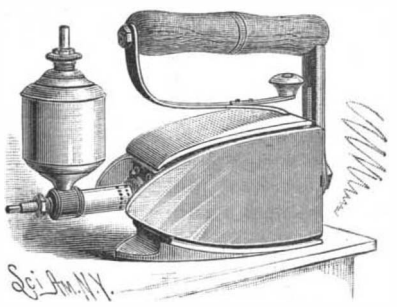
TWO SMOOTHING, ONE FLUTING, AND ONE POLISHING IRON.



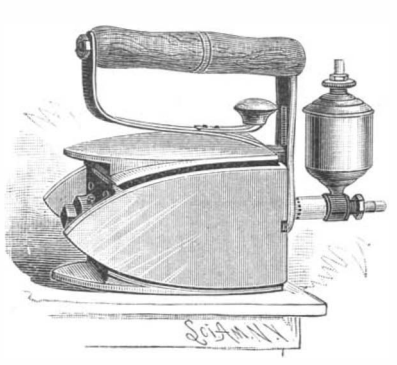
TWO SMOOTHING AND TWO POLISHING.



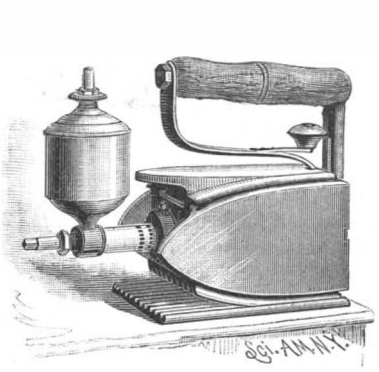
TWO SMOOTHING AND TWO FLUTING IRONS.



THREE SMOOTHING AND ONE POLISHING.

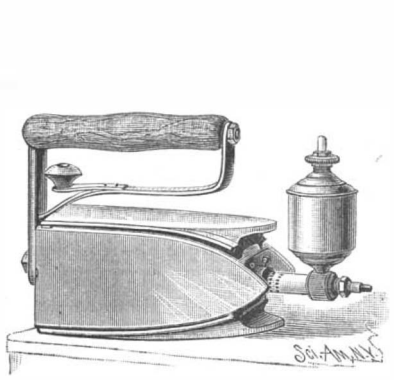


FOUR SMOOTHING IRONS.



THREE SMOOTHING AND ONE FLUTING.

IRON USED AS STOVE, SHOWING FLAME.



HEAVY TAILOR'S IRON. FOUR SMOOTHING SURFACES.

CHABLE'S CHANGEABLE COMBINATION SELF-HEATING REVERSIBLE SAD IRON.

The Patent Office.

It is to be regretted that Commissioner Montgomery insists upon resigning, although his description of his official existence is anything but alluring. "Many a day," said he to a local reporter, "the only thing that kept me from kicking a man, a congressman, may be, out of my office was that it was a public office, and did not belong to me. Day after day I have sat in the Patent Office, subjected to the insolence and abuse from the office seekers, which I would not have suffered for a single moment had I been in my own law office. Naturally, I am not such an ill-tempered person myself, but I fear that the nagging I have had to stand during my two years of office has taken a good deal of the good temper out of me. Women, too, are the cause of it. There is only one thing more difficult to get rid of than a woman seeking office for herself, and that is a congressman seeking office for a woman." Mr. Montgomery has made an admirable commissioner, and it is to be regretted that the office seekers are driving him away.—*The Manufacturers' Gazette.*

The Albert Medal.

The Council of the Society of Arts, London, will proceed to consider the award of the Albert medal for 1887, early in May next. This medal was struck to reward "distinguished merit for promoting arts, manufactures, or commerce," and has been awarded as follows:

In 1864, to Sir Rowland Hill, K.C.B., F.R.S., "for his great services to arts, manufactures, and commerce in the creation of the penny postage, and for his other reforms in the postal system of this country, the benefits of which have, however, not been confined to this country, but have extended over the civilized world."

In 1865, to his Imperial Majesty Napoleon III., "for distinguished merit in promoting, in many ways, by his personal exertions, the international progress of arts, manufactures, and commerce, the proofs of which are afforded by his judicious patronage of art, his enlightened commercial policy, and especially by the abolition of passports in favor of British subjects."

In 1866, to Michael Faraday, D.C.L., F.R.S., "for discoveries in electricity, magnetism, and chemistry, which, in their relation to the industries of the world, have so largely promoted arts, manufactures, and commerce."

In 1867, to Mr. (afterward Sir) W. Fothergill Cooke and Professor (afterward Sir) Charles Wheatstone, F.R.S., "in recognition of their joint labors in establishing the first electric telegraph."

In 1868, to Mr. (afterward Sir) Joseph Whitworth, LL.D., F.R.S., "for the invention and manufacture of instruments of measure and uniform standards, by which the production of machinery has been brought to a state of perfection hitherto unapproached, to the great advancement of arts, manufactures, and commerce."

In 1869, to Baron Justus Von Liebig, Associate of the Institute of France, For. Memb. R. S., Chevalier of the Legion of Honor, etc., "for his numerous valuable researches and writings, which have contributed most importantly to the development of food economy and agriculture, to the advancement of chemical science, and to the benefits derived from that science by arts, manufactures, and commerce."

In 1870, to Ferdinand De Lesseps, "for services rendered to arts, manufactures, and commerce by the realization of the Suez Canal."

In 1871, to Mr. (afterward Sir) Henry Cole, K.C.B., "for his important services in promoting arts, manufactures, and commerce, especially in aiding the establishment and development of science and art, and the South Kensington Museum."

In 1872, to Mr. (now Sir) Henry Bessemer, F.R.S., "for the eminent services rendered by him to arts, manufactures, and commerce, in developing the manufacture of steel."

In 1873, to Michel Eugene Chevreul, For. Memb. R.S., Member of the Institute of France, "for his chemical researches, especially in reference to saponification, dyeing, agriculture, and natural history, which for more than half a century have exercised a wide influence on the industrial arts of the world."

In 1874, to Mr. (afterward Sir) C. W. Siemens, D.C.L., F.R.S., "for his researches in connection with the laws of heat, and the practical applications of them to furnaces used in the arts; and for his improvement in the manufacture of iron; and generally for the services rendered by him in connection with economization of fuel in its various applications to manufactures and the arts."

In 1875, to Michael Chevalier, "the distinguished French statesman, who, by his writings and persistent exertions, extending over many years, has rendered essential service in promoting arts, manufactures, and commerce."

In 1876, to Sir George B. Airy, K.C.B., F.R.S., Astromer Royal, "for eminent services rendered to commerce by his researches in nautical astronomy and in magnetism, and by his improvements in the application of the mariner's compass to the navigation of iron ships."

In 1877, to Jean Baptiste Dumas, For. Memb. R.S., Member of the Institute of France, "the distinguished chemist, whose researches have exercised a very material influence on the advancement of the industrial arts."

In 1878, to Sir William G. Armstrong, C.B., D.C.L., F.R.S., "because of his distinction as an engineer and as a scientific man, and because by the development of the transmission of power—hydraulically—due to his constant efforts extending over many years, the manufactures of this country have been greatly aided, and mechanical power beneficially substituted for most laborious and injurious labor."

In 1879, to Sir William Thomson LL.D., D.C.L., F.R.S., "on account of the signal service rendered to arts, manufactures, and commerce by his electrical research, especially with reference to the transmission of telegraphic messages over ocean cables."

In 1880, to James Prescott Joule, LL.D., D.C.L., F.R.S., "for having established, after most laborious research, the true relation between heat, electricity, and mechanical work, thus affording to the engineer a sure guide in the application of science and industrial pursuits."

In 1881, to August Wilhelm Hofmann, M.D., LL.D., F.R.S., Professor of Chemistry in the University of Berlin, "for eminent services rendered to the industrial arts by his investigations in organic chemistry and for his successful labors in promoting the cultivation of chemical education and research in England."

In 1882, to Louis Pasteur, Member of the Institute of France, For. Memb. R.S., "for his researches in connection with fermentation, the preservation of wines, and the propagation of zymotic diseases in silk worms and domestic animals, whereby the arts of wine making, silk production, and agriculture have been greatly benefited."

In 1883, to Sir Joseph Dalton Hooker, K.C.S.I., C.B., M.D., D.C.L., LL.D., F.R.S., "for the eminent services which, as a botanist and scientific traveler, and a director of the National Botanical Department, he has rendered to the arts, manufactures, and commerce by promoting an accurate knowledge of the floras and economic vegetable products of the several colonies and dependencies of the empire."

In 1884, to Captain James Buchanan Eads, "the distinguished American engineer, whose works have been of such great service in improving the water communication of North America, and have thereby rendered valuable aid to the commerce of the world."

In 1885, to Mr. Henry Doulton, "in recognition of the impulse given by him to the production of artistic pottery in this country."

In 1886, to Mr. Samuel Cunliffe Lister, "for the services he has rendered to the textile industries, especially by the substitution of mechanical wool combing for hand combing, and by the introduction and development of a new industry—the utilization of waste silk."

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A FLYING BATRACHIAN OF MALAISIA.

All the vertebrates have representatives that are endowed with the faculty of flight. This gift has not been refused to the bat any more than to the galeopitheci, or flying lemurs, and in various regions we find squirrels whose skin extends along the sides in wide folds, and forms a large parachute. The flying squirrels (*Pteromys*) are the most remarkable representatives of these aerial rodents, and, among marsupials, the charming *Belidæ*, of the Austo-Malaisian region, are not the least graceful of the flying mammals.

It has been the privilege of all who have sailed in tropical waters to see flying fishes describing graceful parabolas over the water, and endeavoring to escape the bill of the bird or the teeth of the bonito. The reptiles have their flying dragons, and the batrachians include the *Rhacophori* among their number.

The celebrated English traveler A. R. Wallace has, in a remarkable work*—a true *vade mecum* for every naturalist visiting Malaisia—embodied the fruit of his researches and observations made during a stay of about eight years in the islands of Malaisia and New Guinea. During one of his trips to the island of Borneo he was enabled to procure one of those batrachians of the curious genus *Rhacophorus*, and he thus describes it:

"One of the most curious and interesting reptiles which I met with in Borneo was a large tree frog, which was brought me by one of the Chinese workmen. He assured me that he had seen it come down, in a slanting direction, from a high tree, as if it flew. On examining it, I found the toes very long and fully webbed to their very extremity, so that when expanded they offered a surface much larger than the body. The fore legs were also bordered by a membrane, and the body was capable of considerable inflation. The back and limbs were of a very deep shining green color, the under surface and the inner toes yellow, while the webs were black, rayed with yellow. The body was about four inches in length, while the webs of each hind foot, when fully expanded, covered a surface of four square inches, and the webs of all the feet together about twelve square inches. As the extremities of the toes have dilated disks for adhesion, showing the creature to be a true tree frog, it is difficult to imagine that this immense membrane of the toes can be for the purpose of swimming only, and the account of the Chinaman, that it flew down from the tree, becomes more credible."

The naturalist Kuhl, who perished in Java, a victim to his devotion to science, assigns the following general characters to these toads, some of the forms of which he groups under the title of *Rhacophorus:*

Interdigital membranes long and extensible, folded longitudinally when the fingers are not extended; head short, tongue wide, and developed lengthwise, narrow in front, and forked, free behind; tympanum apparent; vomerian teeth situated between the wide spaced posterior nares; the skin of the arm forming along the latter a crest-like expansion. While resembling tree toads in their general external characters, the *Rhacophori*, in their internal organization, recall the frogs, among which many naturalists are inclined to class them.

We herewith give a figure of a large species, drawn by Mr. Clement from a specimen in the Museum of Natural History of Paris. This species, which is known as *R. rheinwardti*, has a green back, speckled with black, and an orange-yellow belly, marked with black dots. Blue blotches are found upon the palms of the four limbs, between all the fingers except the first and second. The general form is well shown in the engraving. The eyes are protuberant, and the snout is rounded in front. Although the dorsal skin, as well as that of the upper surface of the limbs, is smooth, the belly is very granular, as is also the lower surface of the thighs; but the breast and throat are smooth. At the extremity of the very large and long fingers are observed spongy disks of considerable size. The hand has one peculiarity: its fingers are provided in the center with a long, tubercular appendage. The general aspect of the *Rhacophori* is like that of the large and beautiful tree toads of the Papua Islands, one species of which (*Pelodryas cynea*) is remarkable for its splendid azure color. Rheinwardt's *Rhacophorus* inhabits the Sunda Islands.

Exact data are wanting as to the habits of these curious amphibians. It is permissible to believe that, after the manner of tree toads, they dwell in trees and bushes, hunt insects, and, in their gambols, make use of the singular parachutes that nature has given them. In the East Indies and their archipelagoes, and in Madagascar, other forms are met with that have the interdigital membranes more or less developed.—*La Nature*

A FLYING BATRACHIAN (RHACOPHORUS RHEINWARDTI).

* The Malay Archipelago. London, 1872.

The Water Cartridge.

The explosive used is a nitrous compound, which has been given the name of gelignite, or gelatine dynamite, which contains 80 per cent of blasting gelatine, 15 per cent of nitrate of potash, and 5 per cent of wood ground into fine powder, and freed from all resinous matter. It is a soft, pulpy substance of the consistence of putty, is white in color, and is made up in bars an inch in diameter. It is made by Nobel's Explosives Company, Glasgow. It produces no fire, and so does away with the danger of igniting explosive gases that may be liberated by the blasting operations. A length of 3 inches contains a quantity equal in explosive power to ¾ pound of blasting powder, the average charge used in colliery blasting, and the charges vary in length from 3 to 6 or 7 inches. The cartridge consists of a cylindrical case, 18 inches in length by 2 inches in diameter, and is made of specially prepared water tight paper, in the center of which, held in its place by metal webs or diaphragms, the explosive is placed. A detonator, connected with an electric wire, is stuck into the end of the explosive, the outer case filled with water, and the end tied up round the electric wire, so that none of the water can escape. It is then ready for placing in the bore and ramming. The cartridge, as above described, is now in use at the Wath Main, Birley, Manvers Main, Killamarsh, Mitchell Main, and other collieries in the district, throughout North Staffordshire, at the Altofts colliery, and at many collieries in the north of England.

Fixation of the Gaseous Nitrogen by Arable Soils.

According to the author's experiments arable soil continually fixes free atmospheric nitrogen, even without any vegetation properly so-called. This gain cannot be ascribed to atmospheric supplies of nitrogenous compounds, whether gaseous or dissolved in rain water. In the experiments where the rain water flowed away outside after having traversed the soil, the rain removed from the soil, in the shape of nitrates alone, more nitrogen than it had brought in the shape of ammonia and nitric acid taken together. Nevertheless the fixation of nitrogen was more considerable in earth exposed to the rain than in such as was under cover, doubtless by reason of the greater activity of the organisms which fix nitrogen by the circulation of air and water.—*M. Berthelot.*

Chimneys.

For those parts of a chimney which are supported throughout, stone may, under some circumstances, says the *American Architect*, be admissible, but brick is always preferable for the purpose. The abutments of a chimney should be tied into the walls by wrought iron bars of sufficient number and strength, turned up and down at the ends, and built into the jambs for several inches on each side. No part of a flue should be of less thickness than half a brick, or 4½ inches. Where slabs of stone or slate are placed level with a floor before the opening of a chimney, they should invariably be laid in sound mortar, cement, or other incombustible and non-conducting substances, and it should be at a distance of not less than 4½ inches from the joists, flooring, or any other woodwork. A chimney built only up to the roof and stopping at that point is always dangerous. Every chimney in a house should be perfectly distinct and separate from every other chimney, from the hearth to the external opening. Chimneys may safely be built in stacks, but they should on no account have any connection with the stacks. Brickwork around flues should not be less than 4½ inches thick in any part. By the Code Napoleon it was not permitted to build a chimney against the wall of an adjoining house without isolating it by an intermediate wall of sufficient thickness to prevent heat passing to the neighboring premises.

A contributor, writing from Cambridge, Ill., to a local journal, which we copy from the *American Artisan*, gives the following directions for the proper construction of a chimney:

To build a chimney that will draw forever, and not fill up with soot, you must build it large enough—sixteen inches square; use good brick, and clay instead of lime up to the comb; plaster it inside with clay mixed with salt; for chimney tops use the very best of brick, wet them and lay them in cement mortar. The chimney should not be built tight to beams or rafters, as most chimneys settle a little, and if too tight between the beams and rafters, there is where the crack in your chimneys come and where the most of the fires originate, as the chimneys sometimes get red hot. A chimney built from cellar up is better and less dangerous than one hung on the wall. Don't get your stovepipe hole too close to the ceiling—eighteen inches from it is near enough.

New Mode of Preparing Oxygen.

Into a suitable generating apparatus introduce two pints of commercial solution of peroxide of hydrogen (3 per cent) and a pound of dilute sulphuric acid (1·5). Into this mixture allow to enter gradually through a safety funnel a solution of 800 grains of potassium permanganate in 28 fluid ounces of water. Oxygen will be rapidly disengaged without application of heat, the yield from the above quantity of materials being five gallons.—*Bulletin de Pharm. de Lyon, Arch. de Pharm.*

IF you want knowledge, you must toil for it; if food, you must toil for it; and if pleasure, you must toil for it. Toil is the law. Pleasure comes through toil, and not by self-indulgence and indolence. When one gets to love work, his life is a happy one.—*Ruskin.*

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ENGINEERING INVENTIONS.

A car coupling has been patented by Mr. Chancey C. Haskin, of Waltham, Iowa. The invention relates to a former patented invention of the same inventor, for which it provides an improved form of drawbar and coupling hook, whereby cars of different elevations may be coupled together, and when so coupled will be free to turn the sharpest curves.

A railroad cross tie has been patented by Mr. Henry Clay Draper, of Oswego, Kansas. It is a composite tie, made partly of wood and partly of iron, in combination with a track bolt of peculiar form, for fastening the rail thereto, having a solid wooden middle portion, whereby less metal will be used than with an all iron tie.

The construction of ships forms the subject of a patent issued to Mr. Thomas J. Hanlen, of Macon, Ga. The invention covers a vessel whose hull has two keels, joined by arched plates, forming a channel which extends longitudinally throughout the entire length of the vessel, the water surrounding the screws being confined to the channel, in which smaller screws than ordinarily employed may be used.

A method of and apparatus for ventilating railway cars has been patented by Mr. Hiram R. Adams, of Boston, Mass. Combined with a frame having a telescopic screen, the inner section of which is connected thereto, is a doubly swinging sash, to one end of which the outer section of the screen is secured, with various novel features of construction and arrangement of parts.

A valve gear has been patented by Mr. Nicholas R. Brady, of New York City. The main object of the invention is to so place and arrange the valves that they may be adjusted while the engine is in motion or without moving the crank shaft when the engine is at rest, the working parts being in full sight, so that every movement of each valve may be followed by the engineer, and the governor and valve operating mechanism being so connected that the throw of the valves will be automatically regulated.

AGRICULTURAL INVENTIONS.

A combined cotton gin, scale, and press has been patented by Mr. Pitt Edward Williamson, of Washington, Ga. This invention covers a novel construction of portable machine, which may be conveyed to any part of the field, where the cotton can be taken in its natural state at one end of the machine, and ginned, compressed, and delivered as a tied bale ready for shipment from the other end.

A cultivator shield has been patented by Mr. William M. McGaugh, of Converse, Mo. It is designed for use of cultivators of ordinary construction, to prevent the covering of young plants, while permitting some fine earth to fall over them, and consists essentially of a main supporting frame and a series of longitudinal strips carried thereby, having outwardly bent rear ends, with other novel features.

A corn harvester has been patented by Mr. John R. Wilson, of Farmersville, Ohio. It is designed to cut the corn stalks, carry them back in a vertical position, collect them into a shock, and deposit the shock upon the ground, there being a rhomboidal frame connected with the platform and cutting mechanism, with carriers and adjacent shock former, and a pushing mechanism at the open end of the shock former.

A harrow cultivator for listed corn has been patented by Mr. Rollin Woods, of Mankato, Kansas. It is made in three sections and designed to harrow three rows of corn at a time, each section having two beams, the forward ends of which are placed at such a distance apart as to pass along the opposite sides of a row of plants, it being designed to use when the corn is small, and readily be adjusted to cut down more of the ridges as the corn increases in height.

MISCELLANEOUS INVENTIONS.

An obstetrical supporter has been patented by Mr. Joseph J. Stephens, of Coalesburg, Mo. The invention provides a combination of straps, stirrups, and hand pieces designed to ease the labor and materially shorten the time of suffering of the patient.

A thill coupling has been patented by Mr. Theodore Hunger, of Brooklyn, N. Y. The construction is such that the coupling locks automatically through an attached spring, and a set screw may be dispensed with, and the thills removed at pleasure without touching the wheel or using a wrench.

A barrel carrier has been patented by Mr. John W. Shewmaker, of Terre Haute, Ind. It consists of a pair of longitudinal bars hinged to a pair of cross bars, the longitudinal bars being concaved at their centers and having spurs projecting from their inner faces for engaging the sides of barrels, boxes, etc.

A folding bed has been patented by Mr. Karmell Brooks, of New York City. The construction is such that when the bed is to be opened a movable part is swung down into a horizontal position, a foot section is extended, which causes legs to swing downward to support the movable part, when the bed bottom frame is unfolded, and the bed is ready for use.

A plaiting machine has been patented by Mr. George C. Parker, of Buchanan, Tenn. The construction is such that with this plaiter plaits may be laid upon material already made up into garments, and plaits can be renewed or replaited without removing from the garment, and in cotton as well as woolen goods.

A folding music stand and rack has been patented by Mr. Clarence L. Peak, of Binghamton, N. Y. This invention covers a novel construction and combination of parts, whereby both the stand and rack may be compactly folded for transportation, and in which the rack may be used independently of the stand.

A flexible wire gate has been patented by Mr. Theodor Ruediger, of Chaska, Minn. It is designed to have its front or movable bar connected by a diagonal strut brace in such manner as to strengthen the gate, brace the wire strands, and at the same time permit the free movement of the gate and prevent any entanglement of the wire strands.

A shutter for photographic cameras has been patented by Mr. William H. Lewis, of Brooklyn, N. Y. It is adapted for both instantaneous and time work, and with fixed or adjustable lens tubes, the invention covering certain novel constructions and combinations of parts and mechanism for controlling the shutter.

A fence post has been patented by Mr. David Bowen, of Topeka, Kansas (Mary Bowen administratrix of said Bowen, deceased). It is formed in two parts, a foot piece to be driven into the ground, and of such shape as to give the fence a substantial support against strains, and a top or body portion to be held to the foot piece, and adapted to hold fence wires or rails.

A wheel and axle improvement has been patented by Mr. John Pettinger, of Carpenteria, Cal. The invention consists in a wheel and axle made with the hub cast solid, with a hollow spindle and an annular flange and a cup flange, the spindle carrying a hollow axle, while with the hub and its solid flange is connected by bolts an annular plate for clamping the spokes in place.

A carburetor has been patented by Mr. Ferdinand Weil, of New York City. It has a carbureting chamber so made that it cannot be flooded by the accidental escape of oil from the reservoir, with other novel features of construction and arrangement, for commingling the rich vapors of liquid hydrocarbons with ordinary illuminating gas, to increase its illuminating power.

A stethoscope has been patented by Mr. Frank M. Blodgett, of New York City. This invention consists of the application to the interior walls of a stethoscope, and parallel therewith, of a sound-augmenting diaphragm, intended to give a sounding-board effect, thereby augmenting the sound and improving the efficiency of the instrument in detecting sounds within the human body.

A garment supporter has been patented by Catherine Sisson, of Garnett, Kansas. It is designed for ladies' wear, as a support for skirts and hose, the parts being so arranged that the skirt support and the hose support are each adjustable, shoulder strips having hose-supporting clips, and shorter shoulder strips, moving upon the longer strips, having devices for engaging the waistband of a garment.

A combined door plate, knocker, and letter receiver has been patented by Mr. William A. Moore, of Washington, D. C. This invention covers a peculiar combination of parts, in which the name plate is especially adapted for use as a knocker, and all the parts are secured from the inner side of the door, so that the main plate and name plate cannot be removed except by releasing bolts from the inner side.

A wagon tire coupling has been patented by Mr. James J. Pinkham, of Stillwater, Montana Territory. The tire has lugs projecting beyond its ends, with a tongue and groove connection on their adjacent vertical inner sides, and longitudinally apertured ears on their lower faces, with a screw engaging the apertures for adjusting the lugs, whereby the tires may be set or readjusted without heating.

A lock for pocket books, satchels, etc., has been patented by Mr. Louis B. Prahar, of Brooklyn, N. Y. The invention consists in a bent lip and slotted construction of the bottom and flange plates of the lock, in combination with the stud of the lock, riveted to assist in uniting the plates, so the plates may be simply slipped into engaging position and secured by the riveting of the stud of the lock at a single operation.

A feed mechanism for saw mill carriages has been patented by Mr. Newton Hoffman, of Elizabeth, West Va. It consists of a pair of friction cone pulleys arranged in peripheral contact and placed between the source of power and the carriage pinion, one of the pulleys being mounted in adjustable boxes, whereby different portions can be so brought in contact as to produce faster or slower motions.

A wooden basket has been patented by Mr. Thomas L. Lee, of Memphis, Tenn. Combined with vertical staves are an inner and an outer hoop arranged at the bottom and nailed together through the staves, the inner hoop having an inner peripheral groove containing the bottom, thus making a light and strong receptacle to be used as a cotton basket, or for fruit, waste paper, etc.

A can labeling machine has been patented by Mr. Andrew J. Lockhart, of Marshfield, Oregon. It has an inclined chute, about a third of the way down from the upper end of which is a paste tank, across which are mounted rollers, in connection with which is a belt mounted in adjustable boxes, with other novel features, whereby cans may be labeled rapidly and automatically.

A double seaming machine has been patented by Mr. Frank J. Farner, of Armourdale, Kansas. This invention relates to the process of fastening tin bottoms on the cylindrical part of tin buckets, such as commonly used for packing lard, and is designed to do the work in a thorough and speedy manner, and in the same operation to swage or bead the cylindrical part of the bucket.

A musical chart has been patented by Mr. Isaac G. Withers, of New York City. It consists of a revolving tablet, with combinations of the usual musical symbols printed thereon, in connection with figures correspondingly arranged and printed upon a fixed card beneath, to be read through openings in the revolving tablet, to assist in teaching pupils the theory employed in producing harmony in music.

A buckle has been patented by Mr. William Seabrook, of Edisto Island, S. C. It is a buckle in which the tongue and frame are disconnected, and one or the other attached to a separate strip of leather or other material, or to different strips, so that the buckle will be flexible to pass around wheels or pulleys of machinery, in coupling flat belts, or be useful on harness.

An ambulance spring has been patented by Messrs. John A. Hauser, Jr., and Joseph A. Ritzler, of Dayton, Ohio. Brackets support standards from which springs are suspended, hooks supported by the springs having projections which extend through slots formed in the standards, the projections carrying anti-friction rolls, and the invention covering other novel features, to make a spring which will not give undue shock or jar.

A combination tool for squaring, leveling, etc., has been patented by Mr. David W. Warnock, of Lexington, Ky. The body of the tool has a longitudinal groove in one edge, in which is secured a square blade, cut away on its inner edge at an angle of forty-five degrees, and there are various other novel features, making a tool which can be used for squaring, leveling, plumbing, centering cylinders, laying off angles, and other purposes.

A fire arm has been patented by Mr. Athanase Chuchur, of Bahia, Brazil. It is an improved breech loader designed to afford quick, simple, and convenient means for loading, firing, and extracting the cartridge shell, and is also so made that the operative parts, which are few, are contained in the breech block, which may be quickly and readily removed, for cleaning and other purposes, from all connection with the arm.

A method of making dress armpit shields has been patented by Messrs. Moses Stonehill and Moses Kilsheimer, of New York City. It consists in securing two pieces of stockinet or knitted fabric together at one edge by loop stitches, to form an elastic joint or seam, then placing two such united pieces face to face with an interposed layer of waterproof cement, folding the united pieces along the seam, and shaping and finishing.

SCIENTIFIC AMERICAN BUILDING EDITION.

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17. Miscellaneous Contents: Floors and Ceilings, Ancient and Modern. By E. Powell Carr, Consulting Architect, New York; a valuable paper.—Useful Hints on House Building.—Shingles in Modern Architecture.—Diamond Point Nail Set.—Adjustable Wood Measuring Rack.—Redwood Logging.—Grano-Metallic Stone.—Black Birch.—Maple Flooring.—Water Tight Roofs.—Slate Roofs.—A Small Ice House, illustrated.—Mineral Wool as a filling for floors and walls, illustrated.—The use of mortar during frost.—Practical remarks on House Painting, exterior and interior.—Together with a variety of other interesting articles and illustrations, too numerous to mention; and a Compendium of Manufacturers' Announcements, illustrated by upward of one hundred engravings.

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NEW BOOKS AND PUBLICATIONS.

REPORT OF THE COMMISSIONER OF FISH AND FISHERIES FOR 1884. Washington: Government Printing Office. Pp. lxxi. and 1204. Illustrated.

It is evident from the size of this work that a satisfactory review within our limits would be impossible. The report of the commissioner, paged in Roman numerals, introduces the reader to forty-two special reports on subjects connected with fishes. They include reports of steamers and stations on the fisheries, on fish culture, on scientific investigation, etc. The setting of gill nets for cod fishing, with illustrations, is elaborately described; the apparatus of Swedish fisheries, the Jutland system of cleaning and drying fish, and pond culture, are typical titles. Although nominally a report for 1884, its date of publication is 1886.

COMMERCIAL ORGANIC ANALYSIS. By Alfred H. Allen, F.I.C., F.C.S. Vol. II. Philadelphia: P. Blakiston, Son & Co. 1887. Pp. 583. Second edition.

We note with pleasure the present volume, the second of the set of three which will complete the work. In it the subjects of fixed oils and fats, hydrocarbons, phenols, etc., are treated at great length. In the author's preface the promise is made for the third volume, that it will comprise the subjects of aromatic acids and tannins, coloring matters, cyanogen compounds, organic bases, albuminoids, etc. In the volume before us the very full treatment of the subject of fats and fatty oils, including some thirty kinds, butterine, butter, Japan wax, shark liver oil, etc., is noticeable. Under Terpenes we find camphors, copaiba balsam, thymol, and others described. These two samples will give some idea of the thorough treatment of the subject. Little needs to be said on this subject, as Allen's organic analysis is a work so well known that encomium is out of place.

* * Any of the above books may be purchased through this office. Address Munn & Co., 361 Broadway, New York.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

We desire the services of a thoroughly competent man to take the place of our present secretary, who is obliged to retire on account of ill health, and to assist in general management. Experience and first-class business qualifications will be required, and to the right person excellent inducements will be offered. Great Western Mfg. Co., mill furnishers and manufacturers of general machinery, Leavenworth, Kans.

Machine shop and foundry for sale, cheap, at a railroad town. F. M. Mossman, Columbia City, Ind.

Editor of trade publication wants articles on all the trades and use of tools. Writers with practical experience preferred. Address Hand, P. O. box 773, New York.

Parties wanting special machines or machinery built to order, write to Christiania Machine Co., 206 N. 4th St., Philadelphia, Pa. Large shops, improved tools.

Wanted, second hand hard wood Surface Planer about 24 in. knife. Penfield Block Co., Lockport, N. Y.

The Knowles Steam Pump Works, 113 Federal St., Boston, and 93 Liberty St., New York, have just issued a new catalogue, in which are many new and improved forms of Pumping Machinery of the single and duplex, steam and power type. This catalogue will be mailed free of charge on application.

Vises.—No screwing. T. C. Massey, Chicago, Ill.

For the latest improved diamond prospecting drills, address the M. C. Bullock Manfg. Co., 158 Lake St., Chicago, Ill.

Link Belting and Wheels. Link Belt M. Co., Chicago.

The *Railroad Gazette*, handsomely illustrated, published weekly, at 73 Broadway, New York. Specimen copies free. Send for catalogue of railroad books.

Protection for Watches.

Anti-magnetic shields—an absolute protection from all electric and magnetic influences. Can be applied to any watch. Experimental exhibition and explanation at "Anti-Magnetic Shield & Watch Case Co.," 18 John St., New York. F. S. Giles, Agt., or Giles Bro. & Co., Chicago, where full assortment of Anti-Magnetic Watches can be had. Send for full descriptive circular.

Woodworking Machinery of all kinds. The Bentel & Margedant Co., 116 Fourth St., Hamilton, O.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Pumps for liquids, air, and gases. New catalogue now ready.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, polishing compositions, etc. $100 "*Little Wonder.*" A perfect Electro Plating Machine. Sole manufacturers of the new Dip Lacquer Kristaline. Complete outfit for plating, etc. Hanson, Van Winkle & Co., Newark, N. J., and 92 and 94 Liberty St., New York.

Iron Planer, Lathe, Drill, and other machine tools of modern design. New Haven Mfg. Co., New Haven, Conn.

Curtis Pressure Regulator and Steam Trap. See p. 45.

Best Automatic Planer Knife Grinders. Pat. Face Plate Chuck Jaws. Am. Twist Drill Co., Laconia, N. H.

Chucks—over 100 different kinds and sizes in stock. Specials made to order. Cushman Chuck Co., Hartford, Ct.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Friction Clutch Pulleys. D. Frisbie & Co., N.Y. city.

Veneer Machines, with latest improvements. Farrel Fdry. Mach. Co., Ansonia, Conn. Send for circular.

Tight and Slack Barrel Machinery a specialty. John Greenwood & Co., Rochester, N.Y. See illus. adv., p. 28.

Timber Gaining Machine. All kinds Wood Working Machinery. C. B. Rogers & Co., Norwich, Conn.

Band saws, with tipping table. All kinds woodworking machinery. Rollstone Machine Co., Fitchburg, Mass.

Lick Telescope and all smaller sizes built by Warner & Swasey, Cleveland, Ohio.

Send for catalogue of Scientific Books for sale by Munn & Co., 361 Broadway, N. Y. Free on application.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(1) F. W. K. wants (1) a receipt for making bronze paint for bronzing a bust. A. Boil 3 pounds pure linseed oil with 12 ounces finely powdered litharge; strain through a coarse canvas cloth, and allow to stand until clear. 15 ounces of this soap varnish mixed with 12 ounces metallic soap powder (made as follows: To a solution of soda soap in linseed oil, cleared by straining, add a mixture of 4 pints sulphate of copper solution and 1 pint sulphate of iron solution, which precipitates a metallic soap of a peculiar bronze hue; wash with cold water, strain, and dry to powder) and 5 ounces fine white wax, are to be melted together at a gentle heat in a porcelain basin by means of a water bath, and allowed to remain for a time in a melted state to expel any moisture that it may contain. It is then applied with a brush to the surface of the plaster, previously heated to 200° Fah., being careful to lay it on smoothly, and without filling up any small indentations of the plaster design. Place it for a few days in a cool place, and, as soon as the smell of the soap varnish has gone off, rub the surface over with cotton wool or fine linen rag, and variegated with a few streaks of metal powder or shell gold. Small objects may be dipped in the melted mixture, and exposed to the heat of a fire till thoroughly penetrated and evenly coated with it. 2. A good rubber cement for putting on wringer rolls. A. See answer to query 3 contained in the SCIENTIFIC AMERICAN for December 25, 1886. See also Rubber Cement" in article on Cements contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 158.

(2) W. C. L., Michigan, asks: Why is the 4th of March taken for the inauguration of the President? A. The second Continental Congress provided, nine States having theretofore ratified the proposed new constitution, that the new government should go into operation on the first Wednesday of March, 1789, which was March 4.

(3) A. H., Richmond, Va., asks: How is lemon extract made? A. Expose 4 ounces of the exterior rind of lemons in the air until partially dry; then bruise in a Wedgwood mortar; add to it 2 quarts deodorized alcohol of 95°, and agitate until the color is extracted, then add 6 ounces recently prepared oil of lemon. If it does not become clear immediately, let it stand for a day or two, agitating occasionally. Then filter.

(4) L. W. B. writes: I have a lathe with a 21 in. balance wheel, 50 lb. weight. I wish to run a 4 in. circular saw. Will a fly wheel on saw arbor improve the power? A. It will do you no service where the cutting is continuous. It might equalize the speed for knotty stuff or short, quick cuts. You must add muscle to make the saw go.

(5) T. H. T., Buffalo, N. Y., asks: What will clean fly specks from hanging lamps? A. Old ale is excellent to wash any gilding with. It acts at once on fly specks. Apply with a soft rag.

(6) T. J. G. There are many kinds of lamps advertised as non-explosive. We think the non-explosive qualities depend more on burning high test oil than in any protective form of the lamp, although there is no doubt that some forms of lamp are safer than others. There is no lamp proof against explosion that has the wick communicating with the oil chamber. The Student lamp is considered safe from explosion in ordinary use, but is not safe to upset with low test oil.

(7) J. S. asks: Would a watch case of about 8 to 10 karats do for an anode to electroplate with? A. It will not do. It will contaminate the solution too much.

(8) R. L. D. asks: 1. Is it a fact that lightning never strikes a building with a tin roof, provided there is no ground connection? A. No; it is not a fact. 2. Is the field of a telescope finder artificially illuminated, so the hair lines can be seen? I have made one, but can't readily see the hair lines, unless the star is very bright. A. The hair lines are not essential in the finder, except for very high powers. Adjust the finder central with the telescope. The judgment of the eye is sufficient to cover the telescope field in the finder, or use white human hair, which gathers the light, and shows luminous on smaller stars better than colored hair. 3. Can I determine the efficiency of a dynamo by the amount of water it will decompose in a certain time? Must the points be platinum? A. It can be done, but not easily, from the difficulty of measuring the gases. Use platinum points.

(9) J. K. asks the best way to prevent the iron work of heaters in cellars from rusting? A. To whitewash them is the most simple way.

(10) E. H., Boston, asks: How can I make a sulphur bath? A. Use 4 ounces potassium sulphide and 1 ounce sulphuric acid dissolved in 30 gallons of water.

(11) D. J. N. asks the best composition of brass to withstand the corrosive effects of heat and coal gas. Brass is to be used for Argand burners, in a regenerative gas lamp. Zinc is said to cause a white film on the glass, and must on that account be left out. A brass composed solely of copper and tin is so tough, that it can only be worked with difficulty. A. Copper 16 oz., tin 1 oz. makes a good turning metal. Copper 16 oz., tin ½ oz. makes a good stamping metal. Copper with a small portion of nickel is a good resistant to oxidation. Aluminum bronze is also a resistant. All the above are tough, and do not work as easy as common brass. You must not expect too much in labor saving from the higher grade of metals, which are necessary for severe service.

(12) W. H. asks: How do you temper brass for springs, etc., after the temper has once been taken out for shaping? A. Only by hammering. There is no chemical or heat process for hardening any other metal than steel.

(13) C. F. R.—There is no better way of softening lead than recasting. If it is pure, it should be soft. Otherwise use it for other purposes and take new lead for gaskets. Boiling hot water and potash should clean your sewer connecting pipes thoroughly.

(14) W. G. — Locomotives commonly carry from 100 to 125 pounds steam pressure. The exhaust is very variable, and according to the conditions of running. With throttle and link wide open, there may be as much as 20 pounds back pressure.

(15) W. M., Pittsburg, Pa.—The ring piston packing devices referred to were invented and constructed on the principle of expansion by the steam pressure in the cylinder.

(16) T. K. & Co. ask the best varnish or grease for protecting barbed fence wire. A. Common coal tar, with a little tallow melted and thoroughly mixed, is probably the best. All dry varnishes and coal tar alone crack off in handling the wire. If necessary to have it dry enough to handle without marking the hands, a mixture of coal tar and boiled linseed oil (mix hot) may better answer your purpose.

(17) M. A. G. asks why the electric light gives out so little heat, if it is true that the temperature of the arc in the arc light is unequaled by any other artificial heat. A. In a gas or lamp flame an exceedingly small portion of the heat develops light. Hence a production of a relatively great quantity of heat is necessary for the development of a given quantity of light. In the electric arc the temperature is so high that a much more favorable ratio of heat to light appears. For a given unit of light a very small quantity of heat (compared to the same factor in an ordinary flame) is needed.

(18) E. W. S. asks: In what way should two or more electro-magnets be connected in the same circuit, so as to give the greatest amount of power? If two magnets are connected, will each magnet have as much power as one of them would have if the other were left out of the circuit? A. The best way to connect magnets in a battery circuit for power is in series. Each magnet as introduced in the circuit will reduce the strength of the remaining ones.

(19) Accountant writes: I am using an ink on a set of books; it thickens very quickly, and I have found that a little ammonia water will thin it and amalgamate the particles as nothing else (water or fluid) will. Does the use of the ammonia impair the ink in any way or endanger the record in time? A. We can only surmise as to the effect of ammonia or an ink of unknown composition. From what you say we imagine it would not injure the ink. Test two samples, one with and one without ammonia, by writing with each and exposing to strong sunlight.

(20) Ch. asks: Does the crystal which is formed by the freezing of water contain water of crystallization? That water crystallizes when it freezes is plain enough, but does such a crystal contain water of crystallization? A. Ice contains no water of crystallization, as far as known. If so, there would be an uncrystallized or amorphous condition of ice, which has so far never been observed.

(21) C. B., Hartford, asks: 1. Is there any kind of glue or paste that will answer for putting labels on the side of flower pots when in use and filled with soil more or less damp? Supposing a label of white paper is used, is there any way it can be treated by varnishing or some other method, so that it can be washed and made clean? A. Use thin paper for label, and attach with white gelatine in solution, to which has been added 1 per cent of bichromate of potash. This must be done in a dark or obscure room. Then expose the labels to sunlight. After writing, varnish with solution of shellac in alcohol.

(22) H. P. asks: 1. How can I make wine of coca? A. Take of the fluid extract of coca 1 ounce, magnesium carbonate 1 drachm; mix and add of simple elixir and of rectified alcohol each 1 ounce, and 16 ounces wine, then filter. Port or sherry wine may be used. 2. Is it considered a good remedy for dyspepsia? A. A good remedy for some people is not good for others. Better consult a physician.

(23) G. S., Chicago, writes: 1. What is a good receipt for gluing pearl to wood? A. Dissolve 1 part isinglass and 2 of white glue in 30 of water, strain, and evaporate to 6 parts. Add one-thirtieth part of gum mastic dissolved in ½ part of alcohol, and add 1 part of zinc white. When required for use, warm and shake up. 2. A reflector in form of a cube, concave on each of the four sides, has recently made its appearance. It divides the original flame into four small flames, placed so as to reflect from each of four sides of the cube reflector that has been placed on the gas jet. Can these reflectors be of any value in the center of a room? A. Any reflector that does not, by creating draughts or otherwise, interfere with the production of the flame is, as a general thing, useful in directing the light where most wanted. 3. Will steam forced into iron pipes make the pipes hot enough to ignite paper or cloth? A. It is claimed that long action of such heat will, under favorable conditions, effect such ignition, and many fires have been attributed thereto.

(24) S. D. K., Providence, R. I., asks: Is there anything which will dissolve mica so it can be used in a liquid form and afterward be evaporated, leaving a coating of mica on any article which has been covered while in solution? A. No. The nearest you can come to it is to powder the mica and mix and apply with a transparent varnish, giving something of an aventurine effect.

(25) Miss S. G., South Carolina, asks: 1. What is simplest method of etching on glass? A. See article on this subject in SCIENTIFIC AMERICAN SUPPLEMENT, No. 7, also on page 231 of this paper. 2. How can I stain willow chairs mahogany, rosewood, or cherry? A. For mahogany, take nitric acid, dilute with ten parts water and wash the wood with it. For rosewood, alcohol 1 gallon, camwood 2 ounces. Set them in a warm place, then add extract of logwood 3 ounces, nitric acid 1 ounce, and when dissolved. For cherry, boil 4 ounces annatto in 3 quarts rain water, till the annatto is dissolved, then add a piece of potash and boil for 30 minutes longer. 3. How can I clean willow furniture? A. Soap and water will remove dirt, and sulphur fumes will bleach the willow.

(26) M. F. S. asks: What is a good receipt for a good gold wash for a watch? A. Wash thoroughly ¼ ounce chloride of gold, then add to it a solution of 2 ounces cyanide of potassium in a pint of clean rain water; shake well and let it stand until the chloride is dissolved. Add 1 pound prepared Spanish whiting, expose to the air until dry. In applying, make into a paste with water, and rub it on the surface of the article with a piece of chamois skin or cotton flannel.

TO INVENTORS.

An experience of forty years, and the preparation of more than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices, which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN, 361 Broadway, New York.

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March 22, 1887,

AND EACH BEARING THAT DATE.

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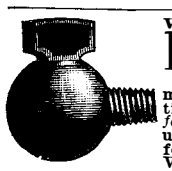
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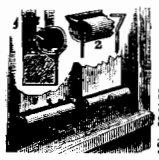

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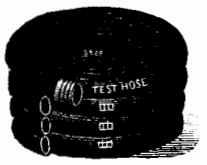

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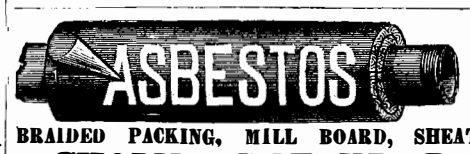

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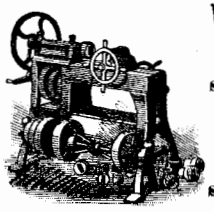

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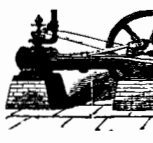

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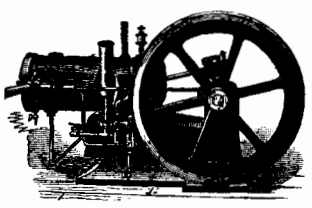

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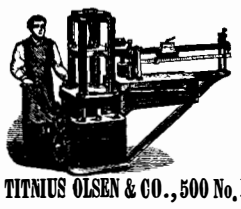

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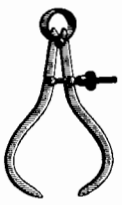

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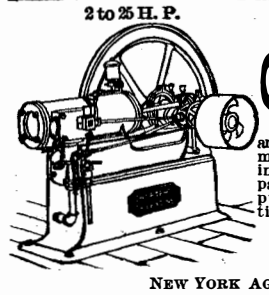

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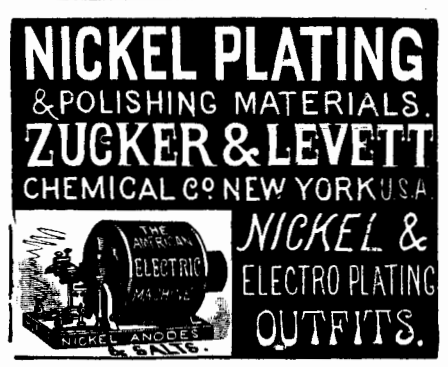

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